SCIENTIFIC AMERICAN

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ST. PIERRE, MARTINIQUE, AS IT APPEARED BEFORE THE ERUPTION OF JULY 9. THIS PORTION OF THE TOWN WAS ENTIRELY COVERED BY THE ERUPTION OF THAT DATE. CROSS INDICATES MONT PELEE.

Photographs Copyright 1902 by E. C. Rost.

THE ERUPTION OF MONT PELÉE ON JULY 9, FIRST STAGE SHOWING CAULIFLOWER EFFECT OF THE CLOUDS OF STEAM AND DUST.—[See page 106.]

SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, AUGUST 16, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

NEEDLESS ANNOYANCES IN FERRYBOAT TRAVEL.

Although the ferryboat system of New York city is probably the best in existence, it is marred by a few serious drawbacks which the companies could easily remove if they set about to do so. In each case the trouble, which amounts to a positive nuisance, results from the extensive use of the ferries which is made by horse-drawn vehicles. We refer, in the first place, to the preventable and extremely annoying delays which occur at periods of high tide, owing to the inability of overloaded teams to mount the hinged bridges connecting the shore with the ferryboats, and in the second place to the intolerable odor which, in hot weather, pervades the wagon drives which extend through the central gangway of the boats. Primarily the delay which occurs when stalled teams are being coaxed up the incline is due to the fact that they are grossly overloaded; but since overloading unfortunately seems to be an evil that is going to stay with us, it is the duty of the ferryboat companies to provide some means by which a stalled dray or wagon can be assisted onto the boat. This might be done either by providing an extra hand-winch on the ferry pier and a snatch block on the ferryboat, so that a rope could be run to the boat and back to the wagon, and the team assisted up the ferry slip by the operators who warp the boats to the slip; or, a small steam winch (of a few horse power) might be placed at the front end of each engine house of the ferryboats for use in emergencies of the kind.

The unsanitary condition of the carriage and wagon driveways is altogether inexcusable, since it is entirely owing to the fact that wooden floors are used where asphalt or some similar impervious material should be laid down. If an asphalt surface were provided and a length of hose connected up in each gangway, the surface could be kept perfectly sweet and clean, and a nuisance which at present calls loudly for the interference of the Board of Health would be at once abated.

NEW METHOD OF ARMOR PLATE MAKING.

A new process of super-carbonization, or "face-hardening" of armor plate has been developed by an officer in the American navy which promises to exert a greater influence upon the struggle for supremacy between guns and armor than was produced either by the American Harvey, or the German Krupp processes before it. The method of increasing the resistance of homogeneous armor plate by hardening its face may be said to have originated in this country when Harvey introduced his process of increasing the hardness by causing the surface of the plate to take up an excess of carbon during treatment in the furnace. Armor with a hard face upon a tough back had, it is true, been already produced abroad, the compound armor, which so many of the old English battleships carry, being of this character. But compound armor had the serious defect that the hard face consisted of a separate plate of steel welded upon a backing of softer and tougher metal. The hard face was secured at the expense of homogeneity, and the serious nature of this defect was realized at the proving grounds when the surface flaked and broke away from the softer back, leaving the plate open to penetration by shells of small caliber. The incontestable superiority of the Harvey armor led to its all but universal adoption throughout the world. Krupp eventually improved upon it, substituting gas treatment in place of the layer of carbonaceous material used in the Harvey method, and also improving the quality of the plate by very careful attention to the details of the furnace treatment. While the high quality of Krupp plate is unquestionable, its excellence is gained at enormous cost, as high as $550 per ton having been paid for this class of armor.

The invention of Lieut. Cleland Davis, of the navy, marks, both in effectiveness and in cost of manufacture, a great advance upon the Krupp system. His method includes the substitution of electrical currents for the heat of the gas-fired furnace, and the direction of these currents against the face of the armor plate while it is in a heated condition by means of massive carbon anodes, in form not unlike the carbons used in arc lights, but of vastly greater size. During his course of experiments, Lieut. Davis found that if a current of electricity were sent from a carbon into the surface of a plate, it carried with it a certain amount of the carbon and implanted it within the body of the metal. The depth of the hardening is determined by the period of time during which the current is applied, and it is claimed that not only is the surface thus treated harder than that treated by the Krupp process, but the depth to which the hardening is carried is increased. The economy of the process may be judged from the statement that while the Krupp plate is kept in the soaking pits at a red heat for from fifteen to twenty days, the same amount of impregnation with carbon is obtained with the Davis process in five hours.

The experimental plate was made at the works of the Bethlehem Steel Company. A moderate thickness, five inches, was chosen, and the only complaint made against the quality of plate was that the hardening of the face was not uniform, a fault which is attributed by the inventors and makers entirely to the experimental nature of the electrical appliances employed and not to any inherent defect in the process. In the next plate that is fabricated, carbon rollers are to be substituted for the present anodes, and with these it is expected that a uniform depth and hardness of carbonizing will be secured. It is estimated by Lieut. Davis that as compared with Krupp plate of equal resistance, the new system will produce plates from 20 to 30 per cent lighter in weight. Further developments of this process will be watched with the greatest interest, and should it prove possible to secure these remarkable results on a commercial scale, the effect upon warship construction will be more radical than anything that has happened in the naval and coast defence world for many years.

It is possible that in the new plate the navy has made answer to the new army high-explosive shell.

MID OCEAN WIRELESS TELEGRAPH STATION.

A scheme is on foot in Liverpool which, it is claimed by the English shipping journals, will soon be in commercial operation for utilizing wireless telegraphy in a mid-ocean post office and signal station. It is the intention to permanently moor at a point 110 miles west of the Lizard a ship which will be equipped with a search-light and a complete set of Marconi apparatus. As the water at the point selected will involve the use of a mooring chain 400 or 500 feet in length, the weight of which would prevent the bows from riding buoyantly over the heavy seas, the vessel will be provided with a horse-pipe placed in the keel of the foremast. The search-light is to have a vertical beam for the purpose of illuminating the clouds and enabling the floating post office to be picked up at night from a distance of 60 miles or more. As the vessel will be located in the fair way of the English Channel, it will be advantageously placed for the distribution of orders sent from shore by the owners to vessels which are passing in or out of the Channel. Thus a ship coming in from the west or from the south could be directed as soon as it picked up the station, to proceed either to Liverpool, Bristol, or an English Channel port. By this means pilotage and port dues would be reduced, and, of course, there would be a considerable saving of time. The vessel will serve as a floating station, which can be approached in any state of the weather, and picked up for wireless communication. The value of this form of post office is expected to be very great. Moreover, lying at the function of the three great thoroughfares of British and continental marine traffic the station should prove particularly valuable in salvage work. The scheme on the face of it appears to be thoroughly practicable, and if carried out it should prove to be of considerable service in the maritime world.

SOME FURTHER GUNNERY EXPERIMENTS WITH THE "BELLEISLE."*

BY OUR ENGLISH CORRESPONDENT.

The Naval Department of the British government has carried out further elaborate gunnery experiments with the obsolete battleship "Belleisle," to ascertain the relative penetrating power of modern projectiles discharged from heavy guns, and the resisting power of modern armor. This is the third test of a similar character carried out by the British Admiralty during the past two years, and much valuable data, otherwise unobtainable, has been gathered. Naval experts and theorists have maintained that the armor generally employed for protecting battleships is proof against gun-fire as it will be delivered under battle conditions, but these practical tests have conclusively proved that the balance of power is yet distinctly in favor of the gun. That is to say, the progressive development of the weapon in respect to velocity, weight, and explosive potency of the shell is superior to the protective armor, and that the thickness of the latter, and its resisting qualities, have not developed commensurately with the improvement of the former. The effect has been of far-reaching importance to the British authorities, since owing to the results obtained with the two previous experiments with the "Belleisle," which were duly and fully related in the SCIENTIFIC AMERICAN at the time, several important alterations have been made in connection with the armor belts and deck defences of the latest English war vessels. For instance, the second experiment unexpectedly proved that the 4-inch armor was quite easily penetrated by 6-inch projectiles. This thickness of armor had been already fitted or ordered for several of the new cruisers. The authorities at once altered the protection for the new vessels to 6-inch armor.

For this latest experiment the "Belleisle" was once more patched up, and placed in a condition similar to that which would exist in an actual naval engagement. An ammunition hoist replete with electrical fittings and trucks was placed in precisely the position relative to the armor which it would occupy in action. The hoist was erected in a battery behind compound armor. The object of this particular arrangement was to enable the Admiralty to ascertain exactly what would ensue if a shell exploded in the vicinity of the ammunition hoist, and how far the machinery of the latter would be deranged by the force of the explosion.

The test was also undertaken to illustrate one or two other important points in connection with naval gunnery, upon which there is considerable divergence of opinion, and also to determine whether certain innovations in connection with projectiles and charges recently carried out in the navies of the various powers are advantageous. For example, England still adheres to cordite as a propelling charge, while other powers employ nitro-cellulose powder. Also, the Johnson cap is regarded dubiously by the British naval authorities. It has been contended that these two acquisitions have resulted in great efficiency and superiority in certain navies. The United States 100-pound projectile, discharged with nitro-cellulose powder, gives a muzzle velocity of 3,000 feet to the missile, as compared with 2,400 to 2,600 feet obtained with a cordite charge, and the former shell with a Johnson cap will penetrate over 10 inches of armor, while its penetration is several inches less without this cap.

Another important feature of the trial was to ascertain the efficiency of a new explosive, similar to maximite, which has been introduced into the British navy as a shell filler.

The "Belleisle" was towed from Portsmouth and anchored off Bembridge as before. Two gunboats, one carrying a 6-inch gun, and the other a 9.2-inch weapon, were selected for firing. The first gunboat stood off at 1,000 yards from the "Belleisle" and fired a shell from the 6-inch weapon, the precise point of attack on the target being the exposed starboard central battery. The shell crashed through the torpedo netting, and pierced the side of the "Belleisle" just above the water line. The armor belting at this spot was of compound type, in vogue twenty-five years ago. A moment after the shell disappeared through the side of the vessel there was a terrific explosion, and a huge column of black dust was hurled high into the air, proving that the shell had penetrated to the coal bunkers and had there exploded.

Another shell was then discharged from the 6-inch gun. The point of attack this time was the conning tower. The shell struck with precision, as the white paint indicating the mark was completely blotched out. The next 100-pound shell was fired at the central battery. A great column of dust was blown into the air, and fragments of steel and splinters of wood were thrown to a distance of 200 yards.

The fourth 100-pound shell was fired at the conning tower, but it did not cause any serious damage so far as could be ascertained from an external examination.

The 9.2-inch gun was then brought into action, and a 380-pound shell was fired at the hulk from the same range of 1,000 yards. The first shot was directed at the central battery. It tore a big hole in the compound armor, and exploded with such violence that the "Belleisle" listed heavily.

A second 380-pound shell was then fired at the conning tower, with the result that the deck was torn up for several yards, and the bridge, situated just above

* The following account of the "Belleisle" trials makes no pretensions to give any detailed account of the destruction in the interior of the vessel, but is merely a description of the purpose and scope of the trials, and the effect of the gun-fire as seen by our correspondent from the outside of the cordon of vessels which was established by the government around the "Belleisle. It is impossible to secure any detailed facts regarding the condition of the ship after the attack for the reason that the Navy Authorities have taken elaborate precautions to prevent such facts becoming public.

the tower, was completely torn from its position and twisted into a fantastic wreck.

Two other shells—a 380-pound and a 100-pound, respectively—were then fired at the central battery; but at this juncture the vessel was so battered that the damage caused by successive shells could not be ascertained, and the trial was brought to an end.

Upon the conclusion of the trials the "Belleisle" was inclosed in canvas to conceal the results achieved and towed into Portsmouth dockyard, where she was dry-docked and a thorough examination was made by the naval officials. The "Belleisle" is to be again patched up for further trials with torpedoes.

HOW OSTRICH FEATHERS ARE CULLED

News comes from California that ostrich farming is now a paying industry. About this season of the year many people from Los Angeles go out to the farms at South Pasadena to watch the plucking of the feathers. To many in the East the plucking of ostrich feathers is probably associated with a violent laying on of hands and a tying down of the bird. As a matter of fact, the gathering of the feathers is a very delicate task.

When the time comes a man carefully examines the flock, and picks out those birds whose feathers are ripening, groups them into dozens, and pens them in, so that they cannot run about and injure their beautiful plumage. When the plucking time comes, the bird is enticed into a narrow, dark passageway. The entrances are then closed and the bird thus imprisoned. A cloth bag is thrown over the creature's head. Then the plucking begins. Three men, perched upon platforms without the pen, reach over the board inclosure and with curious scissor-like appliances pluck off the feathers. Whatever wounds a bird may receive are immediately dressed. The tail feathers are pulled and not cut, simply because they reproduce better than other feathers of the ostrich. While the plucking is in progress the ostrich keeps up a dismal roaring. Were it not for the staunch construction of the pen the creature would kick the boards into splinters.

The first plucking is the most valuable. For that reason the older ostriches are kept simply as breeders.

How successful is the ostrich industry in Southern California may be gaged from the fact that about three-quarters of a million dollars are now invested in it, and the annual output of feathers is worth about $100,000.

MILITARY PHOTOGRAPHY.

Nearly all European nations have had a share in the development of photography in the last ten years, considering it as an important adjunct to the army in both peace and war. During the Spanish-American and South African wars photography was greatly in evidence, and correspondents fairly besieged every fighting force, carrying with them cameras to take pictures of everything of interest to their papers. So remarkable was this outbreak of war photography that the country was flooded with photographs of the war, some of considerable value and others of little use or interest to any. Nevertheless, the actual photographs of the different scenes of the war published in the illustrated papers furnish a fairly accurate history of the most dramatic events, and readers of the future can look back upon those stirring times and gain a far more correct idea of the conditions of the countries and armies than if no photographs had been taken.

But this sort of photography is very different from that undertaken by the war departments of the various nations for purely military purposes. An immense number of photographs of an official nature were taken and developed during both of these recent wars, and these form a part of the regular reports. The general public seldom see these pictures or their reproductions, and there would be little in them of actual interest to the average reader if published. The pictures consist not so much of dramatic events and battles as of dry details of military roads, bridges, breastworks, and photographs taken of the surrounding country from balloons. They are intended to show the nature of the country in which the battles were fought, and the character of the progress made by the army in its invasion. In other words, these official photographs are supposed to illuminate the reports of the officers, and to verify statements concerning the plans and developments of battles. They take to a certain extent the place of military diagrams, which formerly accompanied official reports.

Military photography thus becomes an important part of a campaign. The pictures show the condition of troops at certain critical moments, their arrangements, the condition of the country, and technical points that cannot be illustrated in any better way. During a campaign through an enemy's country the camera in a balloon helps to unfold matters of great importance to one commanding the invading army. During the South African campaign the British time and again obtained their most correct maps from the photographers who took bird's-eye pictures of the country from the cars of balloons. Telephotography became a science that yielded important results to the British commanders in invading a land so little known and so full of pitfalls.

While the South African and Spanish-American wars brought military photography peculiarly to the front, they were not by any means the first wars in which the camera was employed. Most of the European war departments had official photographers attached to the different armies ten and fifteen years ago. In the Abyssinian war England had a corps of official photographers, who provided the commander with pictures of the country around. These photographers accompanied and preceded the army to take photographs of the country for miles in advance, and the commander was thus enabled to study out his march with more accuracy. As early as 1886 there was a field photographic department attached to the English army which performed excellent work for the surveyors. At the Royal Naval College at Greenwich there was a photographic course which enabled officers to learn the mysteries of photography. Every war vessel carried a complete photographic outfit and a dark-room for developing. Since photography has taken rapid strides in improving the process, the English army and navy have broadened their work in this field, and to-day the corps of photographers connected with both navy and army number several hundred.

Russia did not organize a photographic department for army services until the military balloon came into practical use. Then realizing the importance of taking accurate pictures of the surrounding country from the balloon, a corps of expert photographers was organized in 1884 for co-operation with the balloon sections of the army. Since then the department has increased and broadened rapidly, and to-day photography is an important adjunct to the military educational system. There are some dozen or more officers in the army who are experts in this science, and they are masters of all the details of engineering and military science, so they know how best to photograph the country for technical purposes.

To France probably belongs the credit of using the camera for war purposes in a most satisfactory manner at a time when it was of the utmost importance. When Paris was besieged communication with the outside world was had only by means of balloons and carrier pigeons. The despatches sent by the carrier pigeons were photographed on small films, which could be attached to the feathers of the birds, and in this way a single bird could carry thousands of words. Likewise the aeronauts who hovered over Paris, and made the dangerous voyage through the air across the invading army's lines, used the camera for photographing the different positions of the Prussians. These photographs were the first ever taken of an invading army from a balloon. Profiting by this experience, the French army and navy have not only increased their carrier pigeon and balloon services, but they have made the most of photography. Several hundred officers in the French army are expert photographers, and every engineering corps carries with it complete photographic outfits.

Germany is also foremost in this field of military photography, and all the military schools teach the students how to avail themselves of this art. Every balloon corps carries with it photographers who are able to make perfect reproductions of the surrounding country. Italy organized a photographic corps in 1895. It has half a hundred men in the service, and pictures are constantly taken and exhibited for inspection by officers. The barracks, arms, fortifications, and topography of the country are photographed and sent to headquarters for examination. The Austro-Hungarian army and navy have likewise been provided with experts who understand the art of military photography, and all the naval and military schools emphasize the importance of this study.

Without exception all of the leading nations have adopted the camera as a part of every well-equipped army sent into the field, and to be ready for emergencies in times of war the experts are constantly laboring to make their department the most perfect. The engineering corps and the balloon sections in particular depend a good deal upon photography as an aid to their work. Scarcely a regiment of infantry or cavalry will in the next war go into the field without at least one officer or expert accompanying it to take photographs of important parts of the country.

The modern inventions in photography have naturally greatly facilitated military manipulation of the camera for technical work. The modern improved films are now used instead of plates, owing to their light weight and compactness of form. Magnesium lamps are provided for night photography, which sometimes proves the most important of any in reconnoitering. Special dark-room tents for developing the pictures are also provided, and neat, compact cases for carrying the different chemicals. The modern telephotographic attachments have naturally proved of almost indispensable value to the military photographers. By means of it pictures of the surrounding country can be taken at a balloon height of a thousand or two feet, and, so far as the details of the picture are concerned, they are almost as vivid and accurate as if taken fifty feet away.

The army bicycle corps is generally provided with photographic apparatus, and some of the European armies equip each company of bicyclists with cameras, and even send spices out mounted on wheels to snap pictures of the land. Small cameras are carried on the wheels, and they are intended for obtaining snapshots of the land over which the army is to travel. Incidentally, if any sharpshooter appears in the picture he is easily discovered when the picture is developed. For photographing rivers, mountain gorges, and dangerous trails through a new country by an advance corps of engineers or guides, the camera is decidedly important in its ultimate results, and its future usefulness in this direction will continue to increase.

G. B. W.

THE AMOUNT OF WATER USED IN IRRIGATION.

The Office of Experiment Stations, United States Department of Agriculture, has just issued an interesting and valuable report of its irrigation investigations for 1901. It is handsomely illustrated by twenty-five plates and twenty-nine text figures. In it are given the results of the year's measurements and studies of a large number of leading irrigation experts of the arid region, acting under the direction of Elwood Mead, Chief of Irrigation Investigations, among whom are: A. F. Doremus, State Engineer of Utah; D. W. Ross, State Engineer of Idaho; Prof. O. V. P. Stout, of the University of Nebraska; Prof. J. M. Wilson, of the University of California; Prof. O. L. Waller, of Washington; Prof. Samuel Fortier, of Montana; Prof. J. C. Nagle, of College Station, Tex., and W. H. Code, of Arizona, recently appointed Inspector of Irrigation Surveys in the Interior Department, all of whom are resident agents of those investigations in their respective States.

Prof. Mead, in his introduction, speaks of the nature of the work being carried on and the importance of a general knowledge on this subject, for which purpose the bulletin has been written. He speaks of the growing demand for the construction of irrigation work by government aid, and that prior to such construction the government authorities should know how much land can be reclaimed by each proposed enterprise, and that precautions should be taken along this line to prevent mistakes which might seriously retard the development of the West for many years. This is followed by the discussion of the experts above mentioned.

All have made a careful and painstaking investigation and, although they deal with phases of irrigation typical of their own States, the conclusions of all are exceedingly interesting and will be carefully studied by Western farmers and all interested in the development to be inaugurated under national aid.

Mr. D. W. Ross, State Engineer of Idaho, calls attention to the increased duty of water, which is being brought about by a modification of water right contracts. Mr. Ross has given considerable attention to this reform and, owing to his efforts and others connected with this investigation, canal companies are substituting contracts in which the water is measured to the farmer and he pays only for what he uses, in place of the earlier contracts where he was charged for the acres irrigated. In this way the farmer is led to economize because he gets the benefit of his savings. Changes of this kind have increased the need for more accurate methods of measuring water, hence the designing of cheap, efficient water registers has been given much attention by this branch of the department, and a number of new patterns have been invented and are now being furnished to irrigators by some of the leading instrument makers of the country at very reasonable prices.

The duty of water is the leading subject dealt with in all the reports, although each paper discusses the local practice of the region where the measurements were made. These are reviewed in the discussion of the amount of water needed to irrigate an acre of land, by Clarence T. Johnston, Assistant Chief of the Investigations. It shows that the average depth of water being applied to irrigate fields is more than four feet, being 4.35 feet in 1899, 4.15 feet in 1900, and 4.60 feet in 1901. Measurements like these are necessary in order to determine how much land can be irrigated from the reservoirs which the government is to build, and also what will be the value of the water stored in them. Without this information serious errors might be made as they have been made in the past, either because of allowing more water than was needed or in attempting to irrigate too many acres.

The report is in four parts, any of which can be had by applying to the Director of the Office of Experiment Stations, United States Department of Agriculture.

A SMOKELESS AUTOMATIC STOKER.

It was with much interest that we accepted an invitation to witness the practical operation of a successful automatic coal stoker and smoke consumer actually applied to the well-known form of a Babcox & Wilcox water-tube boiler at the Stevens' Institute in Hoboken, N. J., where careful scientific tests have been made covering a period of over two months. It was especially gratifying to note that not a particle of smoke issued from the smokestack.

The stoker and furnace is the invention of Mr. Frederick Girtanner, and is exhibited, manufactured

AUTOMATIC STOKER FOR SMOKE CONSUMING FURNACE.

and applied to any boiler furnace by the Peerless Automatic Smokeless Stoker Company, No. 11 Broadway, N. Y.

The upper engraving presents an external view of the stoker as applied to the Stevens' Institute boiler in Hoboken.

It will be noticed there is an adjustable hopper filled with soft coal, and below a traveling endless grate feed-apron substantially air-tight, which is operated at an intermittent speed by a ratchet movement that carries forward from beneath the bottom of the coal heap a fixed amount of fresh coal to the interior.

Referring to the lower engraving showing a longitudinal section, it will be observed that as the coal is drawn in at the front no air is admitted. At this point the reflected heat from the intense fire at the rear bakes or cokes the coal as it enters the chamber, driving out the gas as in the process of gas manufacture, which, as it comes in contact with the fire beyond, is ignited and complete combustion is secured; as the coked coal is carried further to the rear it burns on the step-inclined grate in a smokeless flame, and is maintained at an intense heat by the draft of air passing through it; thus the full heat-giving efficiency of the fuel is obtained and nothing is lost.

The inclined grate hinged at one end is occasionally swung back and forth automatically by a lever operated in connection with the feeding mechanism at the front and serves to slice or break up the fire, permitting a free circulation of air through it. The ashes fall from the inclined grate to a rear platform grate hinged at its rear, and from which the ashes are easily dumped into the ash pit below.

The practical efficiency of the stoker and smoke consumer over the ordinary method of hand firing is shown by the results obtained not only at the Stevens' Institute but also at a brewery in Guttenburg, N. J., where it was found that 10.20 pounds of water at 212 degs. Fahrenheit was evaporated with 1 pound of coal, as compared with 8.24 pounds of water to 1 pound of coal by the old methods, demonstrating a saving of 20 per cent. In the automatic stoker 480 pounds of ashes and clinkers were left as against 1,123 pounds in the old method. The double utility of this device in effecting economy in fuel and an elimination of smoke commends it to all users of soft coal.

Skillful Mending of a Propeller Shaft.

A clever engineering feat was accomplished during a recent voyage of the British steamship "Baroda" from Algoa Bay to Batavia, in connection with the repair of a fractured shaft while at sea. The vessel left Algoa Bay with a light cargo, and was therefore down at the head, which resulted in the propeller racing considerably more than if she were well down in the water, during rough weather. On the eighth day out the vessel ran into a gale, and during the evening the chief engineer, Mr. J. G. Shepherd, when entering the shaft tunnel noticed an eccentric movement, accompanied by a peculiar sound. The engines were stopped, and an examination of the shaft resulted in the discovery of a severe fracture at the after end of the third length of the shafting, 2½ feet from the coupling, and which extended into the holes of the first and fifth bolts. The engineer immediately set to work to repair the fracture to save the propeller, and as there was no special hurry, cut away the plating of the roof of the shaft tunnel over the injury, in order to obtain light and room to carry out the repair thoroughly. Closer inspection proved that the fracture was such that it could not be closed, so it was made solid with steel wedges, the crevices between which were afterward filled in with Parsons white brass. A number of 3-foot steel plates happened to be on board, and these were clothed round the fracture. This operation satisfactorily accomplished, the engineer proceeded to bind the shaft at the point of fracture with 360 fathoms of 2¾-inch steel wire rope. The wire rope was passed round a winch, and one end secured to the shaft by two 1-inch bolts and ½-inch plate washer. The engines were then set running slowly ahead, drawing the wire rope from the winch, with steam full against it, by which means the desired tension and strain were secured. The wire was carefully followed and tapped round the shaft as the binding proceeded. The rope was bound round the shaft in two layers and carried over the couplings. Progress was necessarily slow to insure the operation being carried out skillfully. So satisfactory, however, was the work performed, that the vessel steamed over 1,000 miles with this repair, and through exceptionally heavy weather; on one occasion she had to heave to for 24 hours until the sea moderated.

The British Zoological Society has been presented by the King with a remarkable zebra hybrid which was sent to His Majesty from South Africa, and is one of the most valuable acquisitions of the society in recent years. In appearance it resembles a small pony, and the color of the body of the animal is brown, lightening to bay on the head and legs. The striping is peculiar. The marks on the barrel are nearly vertical, as are those on the cheeks, while the limb markings are horizontal to the hocks, below which the color is black. On the flanks the stripes are arranged in small patches. The nostrils are black, and between the eyes the markings faintly resemble those of a Burchell zebra, but between this part and the nostrils the color is bright bay. The dorsal stripe is peculiar, tapering toward the tail. It is officially described as a pony bred from a cross between a zebra and a pony.

THE GIRTANNER AUTOMATIC SMOKELESS STOKER.

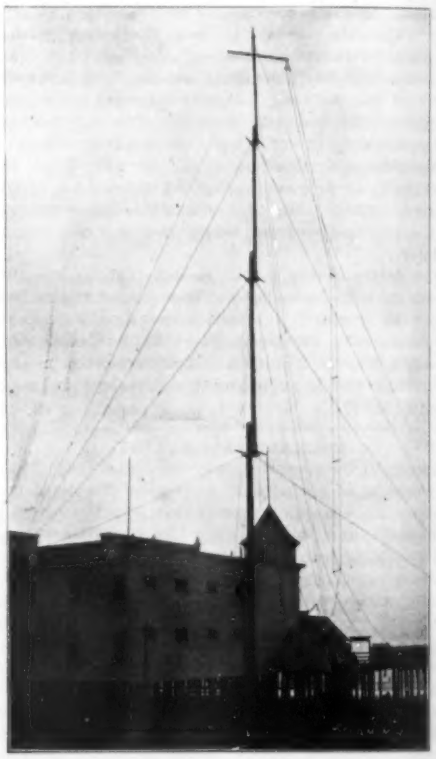
THE DE FOREST SYSTEM OF WIRELESS TELEGRAPHY.

For several months now a regular interchange of wireless telegraph messages has been maintained by the De Forest Wireless Telegraph Company between their stations near the Battery in New York, and at Staten Island.

The history of the inception of the new system is interesting. In 1899 the inventors began the search for a new receiver for use in wireless telegraphy, one possessing that much desired quality of auto-sensitiveness. From the first the necessity for tapping the old coherer to restore it to sensitiveness, the complicated apparatus thus involved, the uncertainty of its action, and the slow speed of word-transmission necessitated, has called for a better, simpler, quicker receiver than that of Branley's.

Starting on this quest various principles were tried, at first without satisfactory results. The device lacked either sensitiveness or reliability. None of the so-called "auto-coherers" filled the bill. During the year following Dr. De Forest carried on his researches in this field in the laboratory of Armour Institute, kindly tendered him for this purpose. There he received the assistance of E. H. Smythe, of the Western Electric Company, and the responder is the result of their combined effort.

The new receiver, or "responder" as it is aptly called, depends on an electrotypic principle for its action. The field of investigation was entirely new, no data existed on the subject, and the present state of commercial practicability attained, together with the complete theoretical study of the action involved, represents years of the closest, most painstaking work on the part of the inventors. The United States Patent Office has granted them very broad claims on the principles involved, and upon the issuance of the papers one will expect highly interesting contributions to the science.



CONEY ISLAND STATION OF THE DE FOREST WIRELESS TELEGRAPH. HEIGHT OF MAST 210 FEET.

During the past year Dr. De Forest has greatly increased the sensitiveness of the responder, while maintaining its great simplicity. For example, the receiver will respond with absolute certainty and regularity to a spark of one sixty-fourth inch length from a small coil forty feet distant, driven by one cell of storage battery with a two-foot antenna at receiver and coil, and without ground connection.

The De Forest transmitter does away with induction coils, all interrupters, and make-and-break devices, as it has been found that a large per cent of uncertainties and failures in wireless messages is due to the imperfections and irregularities of these devices. A special key very like the ordinary Morse key has been devised with a view especially to high speed work. The make-and-break is under oil and the operator is fully protected from contact with high voltage wires. By virtue of the automatic quality of the responder it is possible to use a telephone in circuit with the device, and the employment of a relay is rendered unnecessary. By this means a speed of forty words a minute can be obtained, and under ordinary circumstances a speed of twenty-five to thirty words is regularly accomplished. One hears in the telephone as it were the sound of the sending spark, be this a high or low fre-

quency, in dots and dashes. An ordinary Morse operator can learn to read with the new apparatus with a few days' practice. The sending requires no special knack other than a firm touch, with dashes clean cut.

Although, as the illustration shows, the operator reads from the head telephone, a relay or recording device can be substituted therefor; only there is always this condition, that, inasmuch as the responder, unlike the coherer, is a *quantitative* device and the telephone and ear the most sensitive signaling device known, at the extreme range messages can be clearly read which are altogether too weak to operate any relay. Thus, through the extreme sensitiveness of the responder, an operator with head telephone can receive messages many miles further than a coherer (all other arrangements at transmitter and receiver being the same) can record them. In proof of this it is interesting to cite the test of February 22, when signals from the "Etruria" were heard at the Jersey City station, from a mast but thirty feet above the roof, when the steamer was fully ninety miles distant. This was without any "jigger" or transforming device whatever at the receiving end, and represents an astonishing degree of sensitiveness in this new "responder."

By virtue of the automatic quality of the receiver, whereby the sound impulses as heard are identical in frequency with that of the transmitter spark, the relay or "call" in use employs a reed attuned to a certain frequency per second. Thus only when the calling station uses a frequency of spark in tune with this reed will the "call" respond and summon the listening operator. The opportunity this feature gives to the system for a *mechanical* or acoustic syntony, in distinction from and in addition to the electrical syntony is highly significant.

During the last month a regular station and school for operators has been opened by the De Forest Company on the roof of the Cheeseborough Building, 17 State Street, New York. Here, as shown in the illustration, is a house built of glass over an iron frame, and fully equipped with sending and receiving apparatus. The antenna here is sixty feet in height. The companion station is located at Hotel Castleton, Staten Island, the first hotel in the world, by the way, to be equipped with a wireless plant.

The most important land station yet established by the De Forest Company is that at Steeplechase Park, Coney Island. This enjoys the distinction of having the tallest mast in America, a fine stick of four pieces, standing 210 feet high. This station is supplied with 60-cycle alternating current, at 110 volts, from the Edison mains. This is stepped up in two transformations to 25,000 or 50,000 volts, as desired, and applied direct to the spark terminals. These latter are of special construction and connected with the condensers give a spark of exceptional clearness and power.

On June 14, the first day the Coney Island station was operated, the first communication with a vessel equipped with the De Forest system was also established. On the Ward Liner "Morro Castle," bound for Havana, a moderately high (60-foot) antenna had been rigged, and transmitter and receiver installed, and messages to and from ship and shore were exchanged, until the vessel was fifty miles from port. The Staten Island station kept up a lively exchange of messages until the boat reached the Narrows, when she called off, and the Coney Island station picked her up.

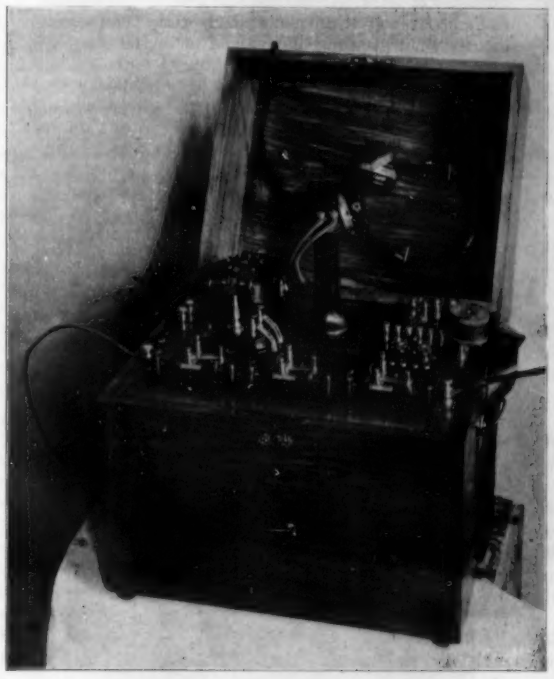
The De Forest Company has secured desirable land near the government light-house at Montauk Point, and proposes erecting a station there at once, as well as others at important points along the coast.

During the last week two operators of the De Forest Wireless Telegraph Company accomplished a feat which, while new in the annals of wireless telegraphy, is only significant of the possibilities before the "responder" or automatic receiver in combination with the telephone.

At the 17 State Street station, this city, two messages were received and read simultaneously by the two operators, listening in on two separate telephone receivers, attached to one and the same responder, and without any special attuning or syntoning device in circuit. One message was from the Staten Island station and was sent quite rapidly, thirty words per minute, with a high-frequency spark (120 per second). The other was from some foreign station, probably a Marconi installation. The speed was about ten words per minute, sent with a low-frequency interrupter. Mr. Horton concentrated his attention upon the Staten Island message, while Mr. Barnhart was able to pick out by their peculiar drumming sound the signals from the other station.

The result is no more remarkable than the fact that two conversations can be carried on simultaneously over the same telephone wire, if the two voices differ considerably in pitch and timbre. But the fact that without any tuning device this can be accomplished with one and the same responder certainly demonstrates the advantage of the telephone receiver over any sounder or tape-recording device, and the greater immunity of such a system from atmospheric and foreign disturbances.

INTERIOR OF A NEW YORK CITY DE FOREST STATION.



THE DE FOREST RECEIVER.

Osier Culture.

BY GREY E. MITCHELL.

On many farms where there is some water front, land otherwise waste can be profitably used for osier culture. While willows will grow almost anywhere, they should be planted for greatest profit in a deep sandy loam, well drained and thoroughly prepared. The ground should be level and moist, but there should be drainage. However, willows will grow in a comparatively dry soil, but the whips will be smaller, though tougher and more durable than when grown in a rich, moist soil. The growth under moist conditions is naturally more vigorous and much more rapid. According to Dr. B. E. Fermow, Professor of Forestry at Cornell, the best situation for free and rapid growth is along the banks of rivers and brooks which pass through a level country and on the small islands which frequently occur in the midst of streams. Hollows or swales, the soil of which is composed of rich, soft, earthy particles, and which can be laid dry, furnish eligible situations for conversion into osieries; if water can occasionally be diverted onto such lands during the dry summer months, the situation may be considered as perfect. There are at present thousands of acres of marshy lands in the country, Mr. Fernow states, not paying 2 per cent per annum, which, if drained at a small outlay and planted with willows, would yield an immense return, paying as high as 20 or 30 per cent profit. The willow reaches its greatest production in the third year, and with proper care and good cultivation it will continue to yield good results for a long run of years.

Willow baskets, hampers, chairs, etc., are a class of articles for which there is to-day an enormous demand. The manufacture in this country is increasing rapidly, but not sufficiently to meet this demand. Five cents a pound for dry willows is the price generally paid. At even a much less price there is a large profit in growing willows and an occupation is furnished for the winter months.

MASKS FROM BRITISH COLUMBIA. THE RIGHT-HAND MASK IS DECORATED WITH PORCUPINE SPINES.

A GROUP OF INDIAN MASKS.

BY FRANK YEIGH.

The fondness of the American Indian for masks or false faces goes to prove that secret societies exist among the red men as among the whites. According to Iroquois belief, certain spirits, whose entity is comprehended in ugly visages, have the power to inflict bodily ailments and to cause diseases to afflict their people. To counteract their evil designs, the Society of the False Faces is maintained among the pagan Iroquois, in order to appease the evil spirits from whom they take their name, as well as to effect a charm against disease and to cure others. When a candidate is initiated into this strange society, the chief False Face thus addresses him: "Brothers, listen! Now you must know that we did not make this custom. The beginning is from Niyoh, our Creator, who is above the false faces. A member of the False Faces must go about among the people in the spring and fall to keep them from sickness, and must visit sick people at all times when called upon. This is all I have to say." Whereupon the new member replies: "I will act according to the ancient customs as advised by the leader of your Society, of which I am now a member."

In a report made to the New York University in 1852 Lewis H. Morgan thus describes the workings of this curious order: When any one was sick with a complaint

MASKS WORN BY THE COAST INDIANS OF BRITISH COLUMBIA.

within the range of their healing powers, and dreamed that he saw a False Face, this signified that he would be cured. A feast was then prepared, the False Faces appeared and, led by a female leader, marched in Indian file, each one wearing a mask and carrying a turtle shell rattle in the hand. On entering the house of the invalid, they first stirred the ashes upon the hearth and then sprinkled hot ashes over the patient until his head and hair were covered, followed by some manipulations over him ending with the sick person marching around the room with his queer visitors, so efficacious was the cure. The mysterious callers were then presented with food, which they took away and ate in secret, as they never unmasked themselves before the people. Among the simpler complaints which the False Faces claimed to cure were nose bleeding, toothache and sore eyes.

The accompanying picture of a hideous mask with a crooked mouth suggests the myth regarding it that for a long time, many centuries ago, there was no being of any kind on his continent but one False Face. One day the Creator appeared on the scene and told the solitary False Face that some other beings were soon to come into the world and it would be necessary for him to keep out of the way. The False Face objected to this, declaring that he had been in possession, and finally refused to be displaced. The Creator then told him that he must leave, and that a hard and fast line must be drawn between their territories, and ordered the False Face to turn himself away while this line was being marked out. The False Face, with exceeding bad grace, although looking in the opposite direction, yet gave sly glances sidewise, and at length turned almost around to inspect the drawing of the line, when he was detected by the Creator, who struck him such a blow on the cheek as to knock his mouth out of shape, and so it has remained until this very day, and the mask portrays the disfigured condition of the disobedient False Face!

The accompanying illustrations depict curious mask work by the Tghimpsean tribe of Indians, on the Pacific coast of British Columbia, on Dixon Inlet and the Skeena River. They were secured by a Methodist missionary—Rev. Dr. Crosby—who labored among them, and these False Faces are now to be seen in the museum of Victoria College in Toronto.

Recent Advances in Civil Engineering.

At the annual meeting of the Institute of Civil Engineers of Great Britain Mr. Charles Hawksley, the newly elected president, delivered an interesting retrospect of the advance made during the nineteenth century in the more prominent branches of civil engineering. First dealing with the subject of waterworks he stated that, though water taken directly from rivers has of late years been regarded with suspicion, it was not improbable that rivers as a source of supply would again grow in favor, especially when the conditions of pollution and the safeguarding of the water by careful and efficient filtration came to be better understood and recognized. Many matters connected with water supply, which were unheard of at the commencement of the last century, are now of everyday occurrence, such as the treatment of certain waters with lime to prevent their action on lead communication pipes, the softening of hard waters, the construction of large depositing tanks to facilitate the deposit of matters in suspension, as well as to enable flood waters to be passed by during the earlier stages of a flood, in cases where the water was taken directly from a river, service reservoirs (in many cases covered to protect the water from the action of light and heat, a precaution more especially needed with certain waters derived from wells or taken directly from rivers), and lastly, but not least, efficient filtration through sand filters, a mode of treatment first introduced by the late Mr. James Simpson in the year 1828. As there still existed much misconception in regard to the quantity of water required for domestic purposes with a constant service, unrestricted use, except in respect to misuse and waste, Mr. Hawksley stated that, having recently had occasion to collect statistics on the subject from sixteen of the principal towns in England, he found that the quantity of water distributed for domestic and other non-metered purposes was on the average of six towns supplied by companies, having a total of 1,185,000 persons, 19 gallons per head per diem, and in the case of ten towns supplied by public authorities, and having an aggregate population of 3,961,000 persons, 18¼ gallons per head per diem. The foregoing quantities provided a constant service for all domestic purposes, including unmetered trade supplies and such waste as cannot be prevented.

Passing to gasworks the president remarked that some idea of the development which had taken place in the size of gasworks might be formed from the fact that whereas in the year 1822 Sir William Congreve, the Government Inspector of Gasworks, reported that at one of the London gasworks several of the gas-holders were each "of the enormous size of 40,000 cubic feet," and the London gas companies now possessed gas-holders having capacities of from 8,000,000 cubic feet to 12,000,000 cubic feet each. Coal gas was now used, not only as an illuminant, but also extensively for heating and motive power. Although for these latter purposes gas, as supplied to towns for illumination, was mostly employed for the sake of convenience, there were many instances in which, from considerations of economy, a specially-made gas of low illuminating power was used. The employment of gas of that nature was likely to become largely increased by the facilities and greater economy which doubtless would before long be afforded by the distribution of Mond gas, the manufacture and distribution of which had, during the present year, received the sanction of Parliament by the passing of the "South Staffordshire Mond Gas (Power and Heating) Company Act, 1901" having for its object the supply of gas (not to be used for illuminating purposes) in large quantities at a price of from 6 to 8 cents per 1,000 cubic feet.

It was at first anticipated by many persons that the competition of electricity would greatly reduce the value of, even if it did not entirely ruin, the coal-gas industry, but such had not proved to be the case, the effect of the introduction of electricity having been to reduce the rate expansion of gas undertakings. The competition of electricity had, moreover, proved

CROOKED-MOUTHED IROQUOIS MASK.

a stimulus to improvements in the modes of consuming gas, such as the incandescent burner, and had led to greater facilities being offered to the gas consumer, such as by the prepayment meter and the letting on hire of cooking stoves.

With regard to electricity the utilization of electric energy had opened out an entirely new field for the employment of civil engineers, and had established a new branch of the profession which has to deal with a subject of so varied, novel, and interesting a character as to have led to the formation, in the year 1871, of the institution of electrical engineers, which already numbered over 4,000 members of all grades, and which devoted its discussions entirely to electrical matters. The great advantages conferred on mankind by the development of electricity were accompanied by certain drawbacks. In the first place there was the undoubted disfigurement of British towns by overhead wires—a disfigurement which it is sought to justify on the score of economy, a plea which was not, in his opinion, a sufficient justification, and one which was not allowed to prevail in some other countries less wealthy than Great Britain. The placing of the wires underground would not only prevent that disfigurement, but would also remove the danger—not perhaps a great one, having regard to the comparative scarcity of the accidents that occur—attending the use of overhead wires. There is a great opening in connection with electric tramways for a good underground conduit system which could be readily applied in this country. Unfortunately the heavy initial capital expenditure required for the present conduit system as compared with that required for the overhead system had prevented its adoption in all but a few isolated cases, but he was hopeful that British electrical engineers would turn their attention to this matter and evolve a conduit system which would greatly reduce the difference now existing between the cost of the conduit system and that of the overhead trolley system. It might be of interest to state that, although electricity was the youngest of the sciences, upward of $650,000,000 of capital had already been invested in Great Britain alone in electrical undertakings.

Lastly Mr. Hawksley referred to the want among manufacturers of a system of standardization—a very important point. For some time past the Council of the Institution of Civil Engineers had realized the serious difficulties and disadvantages under which British manufacturers were placed by the lack in their country of some acknowledged standards. The Council of the Institution of Civil Engineers therefore approached the Institution of Mechanical Engineers, the Institution of Naval Architects, and the Iron and Steel Institute, with a view to taking up this subject, and a strong and influential committee, representing these four institutions, was formed. The evidence laid before the committee was interesting, as showing the various methods in which the different countries carried out their work. For instance, in this country, where the American Society of Civil Engineers has issued standard sections for rails and standard specifications, the rolling-mill makers would in most cases only roll to these sections. It transpired that from time to time various inquiries had been sent to America from Great Britain for tenders for large quantities of rails and of other materials that were needed by British companies, but in nearly every case the reply was that "unless you take our standards we regret we do not see our way to quote." On the other hand, some instructive instances of the waste of time and money that occurs in Great Britain for the want of standard sections were laid before the committee. One case in point was a section incorporated in a bridge for one of the British colonies. The average cost of the material was $42 per ton, but one of the sections specified was of such an odd size and the quantity of this size was so small that the section had to be made by a blacksmith at a cost of from $140 to $150 per ton. It was, therefore, with a view to lessen the cost of and to expedite the carrying out of the works designed by engineers, as well as to enable the British manufacturers to meet the keen competition which is now threatening even the home markets, that the Institution of Civil Engineers had taken in hand this important matter.

Chicago a Great Inland Port.

That Chicago is a great shipping center almost everyone knows. But that it now ranks fourth among the ports of the world is not so well known. The latest figures relating to the matter of shipping are:

London, 16,529,095 tons; New York, 16,445,320; Hamburg, 14,198,817; Chicago, 14,186,100; Antwerp, 13,573,472; Liverpool, 11,818,000; and Marseilles, 9,629,114.

Chicago leads all United States ports except New York in tonnage, and the constant extension of lake traffic has added not only to the commerce of Chicago, but likewise very largely to the commerce of Cleveland, now a very important port of entry; Detroit, Buffalo, Milwaukee, Duluth, and Toledo.

The chief articles of commerce on the lakes are wheat, flour, coal, iron, and lumber. In 1871 the number of bushels of wheat passing through the Soo Canal was 1,376,705, while last year the number of bushels was 60,000,000, or more than forty times as much as in 1871.

Printing in Persia.

Printing from type in Persia is not regarded with popularity. This country is at the present day entirely dependent upon lithography for the native production of books and journals—which are very rare. A short time ago a press with movable types was set up, and upon which a certain number of books was printed. The effort, however, met with no encouragement, and had to be abandoned. The unpopularity of type-printing in Persia is due to two principal causes: First, the straightness of the lines offends a Persian's artistic sense, and, secondly, in printed books the character of the letters is entirely lost. The Persian reader prefers a well-written manuscript, and, failing this, he contents himself with a lithograph, which is usually the facsimile of the writing of some fairly good scribe.

Analysis of Volcanic Dust.

BY THEODORE G. STRAUB.

In a report given out by P. Carmody, F.I.C., F.C.S., government analyst at the island of Trinidad, is a series of analyses of volcanic dust of the recent fatal eruption at Martinique which are rather interesting to note.

The first sample was collected at sea off St. Vincent by Capt. Edwards, S. S. "Louisianian;" the second at Barbadoes, and the third at St. Pierre. As will be seen the results vary considerably, though the general composition is comparatively uniform.

	S.S. Louisianian	Barbados	St. Pierre
Soluble in water—	Per Cent.	Per Cent.	Per Cent.
Chlorine	0.05	0.09	0.05
Soda	0.05	0.09 (large)	0.05 (large)
Lime	0.05 (large)	0.09 "	0.05 "
Sulphates	0.05 "	0.09 "	Trace
Total	0.45	0.45	0.30
Soluble in acids (2 hrs.)			
Iron oxid as FeO	5.60	5.01	3.59
Silica, Alumina, etc.	11 81	6.80	2.01
Lime	2.94	3.26	1.13
Magnesia	Trace	0.40	0 22
Potash		0.05	0.05
Soda		0.44	0.32
Sulphates	Trace	0.28	0.42
Phosphates	"	Trace	0.11
Total	20.35	16.38	7.35
Insoluble in acids—			
Silica and silicates	78.10	83.30	92.38
Loss on ignition	0.50	0.40	0.40
Total	99.40	100.53	100.28

From the above it will be seen that the dust can almost be called a silicate of iron and lime. All three samples show nearly the same amount soluble in water and volatile on heating, though the quantity soluble in acids varies considerably, the greatest being in the first in which there are only traces of the alkali metals and magnesia.

The specific gravity varies from 1.08 for the first to 1.28 for the third sample, the Barbadoes dust being nearly as heavy (1.23) as that which fell at St. Pierre. The latter is the coarsest of the three, 42 per cent of which were caught on a sieve 70 meshes to the inch, while for the "Louisianian" dust only 11 per cent, and for the Barbadoes only 9 per cent were caught on this mesh. In the same order 19 per cent more of the St. Pierre dust was caught on a 100-mesh sieve, 59 per cent more for the Barbadoes, and 63 per cent more for the "Louisianan" material.

In each of the three samples 3½ per cent of the dust was attracted by a magnet, which is rather remarkable. This iron that was attracted was not in the metallic state, but as an oxide.

As to appearance the "Louisianian" and Barbadoes dusts are similar, showing under the microscope light green crystals and black lustrous crystals, both probably silicates of iron. There were also present certain clear crystals. The St. Pierre dust contained reddish crystals not present in the other two.

As to the practical value of these ashes as a fertilizing agent it cannot be said to be very great, though locally their supposed value is greater than it really is. Their main advantage is that they serve to loosen and dry heavy clay soils to quite an extent. The local opinion that they are highly beneficial as a manure is due perhaps to the lime which generally has a good effect upon soils of a clayey nature. Otherwise not much can be said in their favor, since nitrogen is wholly absent and potash and phosphoric acid are present only in traces.

Franklin Webster, editor of the Insurance Press, has made a very interesting compilation of underwriting corporations that have retired from business in the United States during the last two or three decades. The summary is rather appalling, and shows how narrow is the margin of profit obtainable from the business to-day. Mr. Webster speaks thus of the exhibit: "The Insurance Press knows no better way to emphasize the magnitude of the problems confronting fire-underwriters, to demonstrate the unwisdom of legislative attacks on the insurance business, and to explode the fallacies concerning insurance 'profits,' than to ask the American people to gaze upon the list of joint-stock fire insurance corporations that have given up the struggle, and to reflect upon the causes of the failures. The object lesson is impressive. The Insurance Press has invited and received the co-operation of insurance departments in making up the record that follows, and has made use of other data, especially reports by the National Board of Fire-underwriters. During the past twenty-five years the fire loss in the United States has exceeded $2,800,000,000. This year the value of property destroyed by fire will exceed $170,000,000. Nearly 1,200 fire-insurance companies with paid-in cash capitals, mutual companies not included, have gone to the wall in the United States. Nearly all of these companies have been either burned to death or crushed out of existence by oppressive laws."

Automobile News.

The 100-mile endurance test of the Chicago Automobile Club was held over the rather poor and rough roads in the neighborhood of Chicago on the 12th inst. Of the twenty-nine starters, nine made a perfect run and were awarded blue ribbons; four averaged 99 per cent, obtaining red ribbons; one, 97 per cent; and two, 93 per cent. The best time for the course was made by Mr. F. X. Mudd, who, in a Winton touring car, covered the hundred miles in 7 hours 16 minutes. Another Winton was a close second. The average gasoline consumption was about 6 gallons, the carriage holding the record for lowest consumption being the Pierce motorette, which used 3¼ gallons. A number of the contestants were disqualified because they tried to make up time in the last controls. The arrangements were excellent and the timing was accurately accomplished. The test was one of the most successful which has been held this year.

The Kansas City, Mo., Automobile Club held a 100-mile endurance test recently over the macadamized roads in the environs of that place. Seven out of fourteen starters finished, a Haynes-Apperson machine coming in first within one minute of the 6 hour 9 minute limit. Several Pierce motorettes participated in the run, a part of which was made in a heavy rain.

The Automobile Club of America will hold a 500-mile reliability trial in October. The trial will be made over the New York-Boston route, via Springfield and Worcester, Mass. The start will be made from New York on October 9, and the arrival in Boston will occur on Saturday afternoon, October 11. Sunday will be spent in Boston and the return to New York will occupy the three days following. The run is open to all classes of automobiles of either home or foreign make. The club will supply an official observer for each machine entered.

The club is compiling a register of reliable mechanics and operators and it wishes the names of proficient chauffeurs who desire positions with club members.

Failure of the Baldwin-Ziegler Expedition.

All patriotic Americans are disappointed to learn of the failure of the Baldwin-Ziegler expedition to the North Pole. This expedition, it will be remembered, started out with a most complete equipment. Money was not spared in the purchase of the explorers' outfit, which comprised the very best of all that modern science could suggest. The cause of Mr. Baldwin's failure to reach the North Pole is ascribed to the ice which blocked all channels through Franz Josef Land, and prevented the establishment of depots by steamers last fall. The breaking up of the ice early in June compelled the use of reserve supplies, and hence it was necessary to leave Camp Ziegler on July 1. However, as Mr. Baldwin puts it, he has been "baffled, but not beaten," from which we are led to expect that a second attempt will be made next year, which it is hoped will meet with better success. The chances are very favorable for another "dash to the pole" because of the enormous depots of condensed food which were established by means of sledges at important localities this year.

American Agricultural Implements Wanted in India.

The United States Department of Agriculture has received a request from India for information in relation to American agricultural implements. The writer desires catalogues giving descriptions of reapers, corn binders, plows, and other agricultural implements, together with the cost of transportation to that country. He also asks if there is to be found a plowing machine worked with wheels, of simple construction and moderate price, which will turn up land 2½ or 3 inches deep and can be operated by one man or steam power.

The writer is willing to act as agent for the introduction of such implements. Manufacturers and dealers who may be interested in the matter should address Charu Caundra Basu, P. O. Mehurpur, District Nadia, Bengal, India.

The Current Supplement.

The current SUPPLEMENT opens with a handsomely illustrated article on the warships at Spithead for the Coronation Naval Review. It contains also a very complete and copiously illustrated article on wireless telegraphy and submarine cables. A subject of much interest deals with the forests of the Philippine Islands, which shows the great extent of the timber lands and the varieties of wood there found. The Development of Electro-Chemistry is fully treated in a comprehensive article by Mr. R. H. Johnston. Our readers will be interested in the paper by Mr. Graham Bott on Perfumes; Their Antiquity and Uses, with Formulæ. Meter-Gage Fairlie Engines for the Burma Railway Company is the title of an article which will prove of great interest to all connected with railroad affairs. The usual Trade Notes and Recipes are given together with Trade Suggestions from United States Consuls.

Science Notes.

A novel type of vessel has been inaugurated by Capt. W. M. Walters, of Liverpool, for reporting purposes in connection with the English mercantile marine. The first vessel is to be fitted with the Marconi wireless telegraphy system, and is to be moored near the Jones Bank, 66 miles west by south of the Bishop Rock, Scilly, to report between the ship and the mainland. The commercial value of the plan is that it will obviate the necessity and expense of a ship putting in at ports "calling for orders."

The British Admiralty have decided to build their destroyers much stronger in the future than those already in existence owing to their frequent breakdowns, due, according to the findings of the naval experts, to the general frailty of construction. Stability and strength have been sacrificed to too great an extent in order to obtain high speed. This latter desideratum has therefore greatly militated against the success of this type of boat, since recent events and prolonged inquiries have shown that it cannot withstand the heavy baffelings of the waves encountered in a rough sea. Strengthening of these boats will, however, result in a reduction of speed, so they will not be efficient for one particular purpose for which they are required—scouting. To supply this deficiency, however, the Admiralty are introducing a new type of warship described as the "Scout" class, and from this appellation the function for which it is intended may be realized. These new vessels are to be much longer and stronger than any destroyers hitherto built, and will be able to remain longer at sea than either torpedo boats or torpedo destroyers. They are to have a speed of 30 knots an hour. Four vessels for experimental purposes are to be laid down at once, for the construction of which $147,175 has been allotted. The Admiralty do not intend to initiate the design of this type of boat, but the various private shipbuilders are to draw up plans, coinciding with the special requirements of the navy, so that the Admiralty may have the choice of a selection.

M. Henri Moissan has been making experiments with silicide of calcium in order to determine its properties and especially to find out whether it possesses any analogy with carbide of calcium in the formation of compounds like acetylene. Although the silicide of calcium has already been prepared in a more or less pure state its properties have been but little known. M. Moissan prepares it by heating in the electric furnace a mixture of calcium oxide and pure silicon. The mixture is heated in a carbon tube closed at one end, using a current of 600 amperes at 60 volts. The melted mass is not homogeneous, but is surrounded by an external layer of carbide of calcium and below are striæ of crystallized silicate of lime, while in the center is a brilliant mass of silicide of calcium, mixed with varying quantities of silicon. The reaction is thus represented: $2\ Ca\ O + 5\ Si = 2\ Ca\ Si_2 + 2\ Si\ O_2$. The silicide is then separated by an appropriate treatment; it is easily characterized under the microscope by the formation of yellow crystals of silicon on contact with weak hydrochloric acid. As to its physical properties, the mass of silicide may be pulverized in an agate mortar. It has a metallic appearance, and is made up of crystals of undetermined form. The crystals are of a grayish color and very brilliant. The density of this body is 2.5. It is insoluble in alcohol, ether, benzine or ammonia. It presents some chemical reactions of interest; it does not combine with hydrogen at redness, but takes fire when cold in fluorine gas, giving off fluoride of silicon and forming a fluoride of calcium which is partly melted by the heat. Chlorine does not attack it cold, but when heated in a current of the gas it becomes rapidly incandescent and produces chloride of calcium and silicon chloride. When heated in air or oxygen it is but slightly attacked, but under the oxyhydrogen blowpipe it burns with incandescence, forming lime and silica. When the silicide is heated in the electric furnace for 10 minutes in the presence of carbon, using a current of 800 amperes at 60 volts, it is completely transformed into carbide of calcium and silicide of carbon. Melted copper dissolves it but slightly, while, on the contrary, aluminium dissolves it readily but also decomposes it, forming silicide of aluminium. The latter body, when acted upon by hydrochloric acid, gives off hydrogen silicide gas which is spontaneously inflammable. Cast iron in fusion decomposes this body into silicide of iron and carborundum. The action of water upon the silicide has been especially observed, owing to its analogy with carbide of calcium. When reduced to powder and placed in water the decomposition is very slow and even requires several months. In this case it gives off hydrogen and does not form any products resembling acetylene. The acids act upon this substance to a greater or less degree; one of the most striking reactions is that of hydrofluoric acid upon its powder. In this case it becomes incandescent, giving off fumes of silicon fluoride and producing silicon of a yellow color.

MONT PELÉE IN ERUPTION.

BY E. C. ROST, SPECIAL CORRESPONDENT.

It is not my intention to review the events that occurred on Martinique just before the fatal 8th of May and up to the final destruction of the town, but to give a brief account of my observations during some of the eruptions of Mt. Pelée and my ascents of the volcano, in connection with the American and English Scientific Commissions.

St. Pierre, perhaps the most beautiful of all West Indian cities, with its pretty houses nestled at the foot of the verdure-covered cliffs, with the brilliant coloring of the town reflected in the perfect blue of the Caribbean waters, and the mass of picturesque shipping anchored in the roadstead, exists only in mem-

Photograph Copyright 1902 by E. C. Rost.

SECOND STAGE OF THE ERUPTION (30 SECONDS LATER) SHOWING THE CLOUD OF VAPOR SPREADING AND DESCENDING ALONG THE SLOPE OF THE MOUNTAIN.

Photographs Copyright 1902 by E. C. Rost.

THIRD STAGE OF THE ERUPTION (1 MINUTE LATER) SHOWING VAST AREA COVERED BY THE CLOUD—THE SAIL OF THE SLOOP FROM WHICH THIS PHOTOGRAPH WAS TAKEN WAS DESTROYED THIRTY SECONDS AFTER THE PLATE WAS EXPOSED IN THE CAMERA.

ory. It would take the pen of a Danté to do justice to the scene. St. Pierre, only a few weeks since a city full of human souls, is no more. It lies consumed before us, silent and desolate, a city of the dead.

No words can convey the vastness, the completeness, of the destructive powers that have wrought this weird transformation. A party of three of us decide to explore the volcano, on the leeward side from St. Pierre, moving up over the track of the forces which came from Pelée's crater on their awful errand of destruction. We take every precaution we can; our boat manned by five natives, is to lie off shore, ready to pick us up at any hour. We decide, however, to visit St. Pierre first. Here we find that the sea front shows no material change. Many buoys are still there, the sea wall of heavy masonry shows the same old water marks, coral and sea moss. We next travel through what once were streets, but are now masses of broken stones, iron work, wood, and dead bodies, all covered by the prevailing lead-colored dust. It was with great difficulty that we wended our way up through the ruins, because of the great depth of the dust. Then we crossed the deep mud flats, occasionally stepping into a decomposed body. We succeeded in reaching the bluff above that section of the town known as the Fort. The other two sections were called Centre Mouillage, from which point we have an extended view of Mt. Pelée, or rather what was at one time Mt. Pelée, but is now a mass of torn and broken rocks, mud-lava, ruins of houses and plantations, with ravines and hills of débris; yet withal, the general outline of Pelée is as of old.

At our feet (some 300 feet below) still flows the Riviere Roxelane, which is spanned by two bridges, one of stone, the other or iron and steel—on the latter heavy steel plates were all bent away from the mountain side. Just beyond the river we see cropping out here and there on the various terraces, parts of buildings; for this section of the city was buried under a tremendous mud-lava flow which in one section measured quite 200 feet in depth. This bed of volcanic matter, mud-lava, pumice-stone and dust, completely covers the leeward slopes of Pelée, filling up deep ravines and valleys, and as we view the volcano from St. Pierre, it seems an easy and gradual ascent to the very summit. We decide, however, to make the ascent up the valley of the Riviere Blanche, down which swept the death-dealing blast from the crater.

Having spent the night at Carbet, enjoying the hospitality of Charles Gouyet, the administrator of the northern section, we start at the low-vitality hour of 4 A. M., our boat taking us to the mouth of the Riviere Blanche, and travel up the at first gradual slopes, and over hot, red-hot, beds of ashes, over which a cool crust has formed of sufficient strength to bear our weight. Now we find beds of pumice, then again soft mud; but generally we travel through dry dust, all of a dull leaden color, save that here and there the red ashes still show through. Occasionally we are treated to a supposed eruption. By that I mean an entirely superficial eruption. These are caused by the deposits of red-hot dust, sliding as does a land slide, into the river, when vast clouds of vapor and dust ascend at times not only up to, but actually through and above the clouds. These superficial eruptions occur sometimes only fifteen minutes apart, then, again, we have but one or two a day.

Photograph Copyright 1902 by E. C. Rost.

CRATER OF MONT PELEE JULY 4. THE FIGURE AT THE LEFT IS DR. T. A. JAGGAR, JR., OF THE U. S. GEOLOGICAL SURVEY.

By 7 A. M. the aneroid shows us to be 2,500 feet above sea-level, and about opposite the crater, out of which come the real eruptions. Practically at the crater's edge we find old sugar-cane fields, where are seen the charred remains of cane, which have been covered with great deposits of dust, but which are now furrowed by the heavy rains, which have left the deposits in queer, fantastic shapes. Then again we cross great high ridges of mud-lava. Just ahead of us is revealed the huge cup-shaped cone or crater proper, but our view of this is but for a moment at a time, for it is now the rainy season, and clouds continually hover over and cover the mountain; moreover, steam and vapor rising out of the crater prevent a good view. In a northeasterly direction and looming far above us we see the huge "Shark's Fin," a tremendous cliff, left standing when the very top of Pelée was blown away. The summit is now 4,140 feet, and was formerly 4,290 feet high, being lowered by but 150 feet. These figures do not give a true idea of the great fissure in Pelée's sides, which runs toward the west from the crater. Along this fissure have been thrown great angular blocks, and huge rents have been torn into the sides of the slopes, out of which come puffs of dust-laden steam. All is in a turmoil and seems to be moving not down the mountain sides, but in every direction. The old Lac des Palmistes, a lake near the summit on the easterly side, supposed to be the old crater of fifty-two years ago, is now dry and covered with angular blocks of stone, vomited by Pelée. From this point there is an easy descent down the eastern slopes to Basse Pointe and Morne Rouge, but we prefer to descend again along the Riviere Blanche valley, as in this direction came mostly all of Pelée's destructive forces. Save for our hearing some severe rumbling within the crater, resembling the rushing of steam and the sound of boiling water, the

Photograph Copyright 1902 by E. C. Rost.

NORTHERN PORTION OF ST. PIERRE COVERED BY A MUD FLOW WHICH AVERAGES 200 FEET IN DEPTH. IN SOME PORTIONS OF THE VALLEY ABOVE, THE DEPTH OF DEPOSIT WAS 600 FEET.

descent was uneventful, unless I may add that the temperature as we rested for a few moments proved to be quite cool, so cool in fact that coats were longed for. This was at an altitude of 2,000 feet, half-way up the volcano.

On reaching the shores near our starting point we find our boat in waiting, with the native crew most anxious to leave, and we ourselves possessed of a pleasurable feeling that we were again in a comparatively safe place. Safe only by comparison with other places within the range of Pelée's activity (a circle of 10 miles in diameter); for while off this very point in our frail craft a few days later we were so fortunate as not only to see one of Pelée's most important eruptions, that of July 9, but to escape unhurt. We had just returned from another exploring expedition of the lower slopes, and of St. Pierre, when the rumbling and hissing seemed louder than usual. The cauliflower clouds, so peculiar to and characteristic of Pelée, suddenly became darker in color, and above all arose the much dreaded "black smoke," which seemed to pour over the sides of the volcano, then form itself into a great, huge mass which rolled with a circular motion down Pelée's slope toward St. Pierre, spreading itself out more and more, and coming for miles out over the Caribbean Sea, enveloping everything in darkness, covering all with the gray dust, ashes and pumice stone. Our crew seemed to think it necessary to spend their time on their knees and pray, and we were thus forced to use the oars to the utmost of our strength to bring our craft farther on down toward Carbet, for we knew that the bluff south of St. Pierre has thus far warded off the deadly blast, thus leaving a place of refuge, perhaps one-half mile off shore. This eruption lasted from 6 P. M. until 10:30 P. M. Having witnessed this and other eruptions of Pelée I am inclined to believe that the destructive forces consisted of superheated steam, hot pumice and a blast of tornadic force, which swept everything before it. Add to this the electric disturbances, which at times were so vivid as to quite resemble shooting flames, and the peculiar feature that the electric disturbances were much more noticeable at the water level.

I am satisfied that St. Pierre and its people were slain by superheated steam, laden down with an almost incalculable weight of red-hot sand, stone and pumice and traveling with a circular motion, at hurricane speed. After this blast had passed over St. Pierre it carried the heroic-sized statue of the Virgin, which stood on a bluff to the south, fifty-two feet from its base, and then overturned and tore from their carriages huge modern cannon, which stood in the fort still farther to the south. Daylight next morning revealed a scene of utter destruction. In every direction from Pelée's crater great rivers of hot sand and mud were tearing and roaring down its sides, while steam was issuing from every crevice. St. Pierre was again covered with ashes, and the foliage between St. Pierre and Fort de France was covered with a gray mantle.

To witness such an eruption is an experience never to be forgotten. I would not have missed it for much in this world. As to the future, no man, scientist, or layman, can predict just what Pelée will do. "Stay away at least for a time" is the only safe advice.

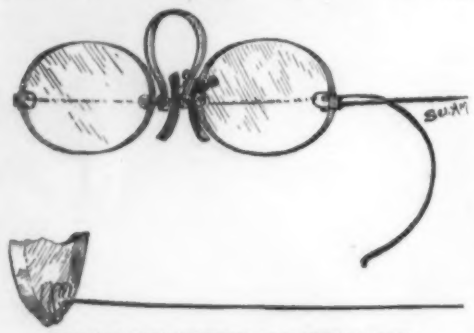
Much has been done by scientific men, much has been learned as a result of Pelée's later eruptions. But much more remains unanswered.

Now just a few words more as to my own observations. One of Pelée's big eruptions at night, as witnessed at a distance of eleven miles, was quite as awe-inspiring, even more weird and uncanny than the eruptions I witnessed at close range. The skies in the direction of Pelée become impenetrably inky black. This black mass moves upward and toward you. Suddenly all over this black space appear myriads of lights, just like incandescent electric lights; now they glow, now all is dark. There is no perceptible motion to these lights. But suddenly they all move in one direction, then in another. Now up, now down; now east, now west. Then just as you think you have discovered their line of motion they suddenly dart in every conceivable direction. You see everywhere: now sharp, zigzag flashes, now circular, like myriads of monster pin wheels; now all have a spiral motion, then of a sudden all is dark again, and you think the worst is over. But no, they appear again; are much more active and much nearer; the blackness now extends from the horizon in the north quite over your head; in a few minutes more it has spread out like a huge umbrella, quite to the southern horizon, completely shutting out all sky. But lo, and behold, of a sudden the scintillating lights and flashes appear again, and under that black pall, now so completely surrounding us, are seen all of nature's clouds that before the eruption were visible by moonlight, placidly floating by and all brilliantly illuminated by the electric display far above. In a short time dust falls upon us, and then stones, the size of walnuts. It was a majestic scene that will live as long as memory endures.

Patent Department

SOME RECENTLY PATENTED NOVELTIES.

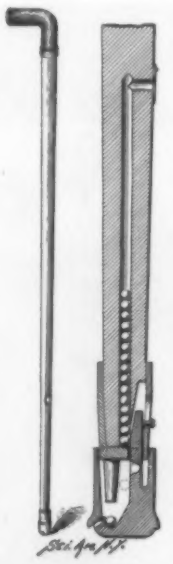
TEMPLE ATTACHMENTS FOR EYEGLASSES.—Spectacles, though not so stylish and neat in appearance as eyeglasses, are nevertheless greatly used because they can be so much more securely held in place. Occasionally a man carries a pair of each style,



TEMPLE ATTACHMENT FOR EYEGLASSES.

using the spectacles only whenever his duties or pleasures do not permit of the convenient use of eyeglasses. This, however, is a great annoyance, and is quite expensive where high-priced lenses are worn. Our illustration shows a much cheaper method of adapting one's eyeglasses to varied requirements. A pair of temple pieces are provided which are adapted to be clamped to the lenses of the eyeglasses, thus converting them into spectacles. These attachments are very simple, and can be cheaply made, so that if lost they can be replaced at but slight expense. By their use the glasses will be firmly held, no matter how violent the exercise or how warm the weather. A patent for this attachment has recently been granted to Mr. E. L. Lembke, of New York city.

MAGAZINE TORPEDO-CANE.—A simple amusement for children is provided by the invention of Mr. John H. Fox, of Fostoria, Ohio. The device comprises a cane having a hollow bore which forms a magazine for storing a number of torpedoes. On the end of this cane is a selector for feeding a single torpedo at a time from the magazine, and a detonator for exploding the torpedoes as they are fed out. The detonator consists of a pin formed on the bottom of a sleeve ferrule which is fastened to the end of the cane and closes the lower end of the magazine. A mortar embraces this ferrule and allows it a limited vertical motion therein. The mortar is provided with an arm which passes up into the bottom of the cane and forms a wall for the lower end of the torpedo magazine. In this arm is a recess so located that the lowest torpedo in the magazine will be forced by gravity therein when the cane is in its lowest position. As the cane is raised, the mortar remains stationary and the torpedo rests in the recess until the lower end of the ferrule has been cleared, when it drops by gravity into the firing chamber. On the next downward stroke of the cane, the detonator pin explodes this torpedo and at the same time the next lowest torpedo in the magazine drops into the recess of the selector arm; thus the torpedoes may be rapidly and successively delivered to the firing chamber and exploded.

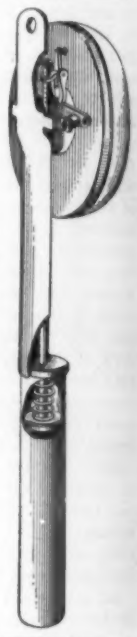


MAGAZINE TORPEDO-CANE.

IMPROVED GRADOMETER.—While not absolutely essential, a device fixed to the automobile which will tell

AN AUTOMOBILE GRADOMETER.

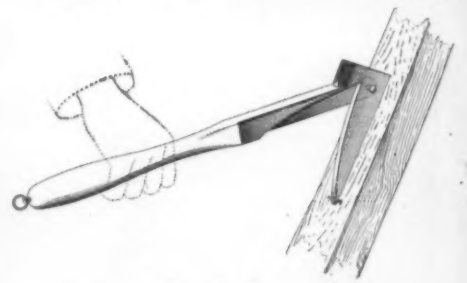
at a glance the per cent of a grade being climbed is a great source of satisfaction. There are a number of gradometers on the market, but most of them are built on the lines of the spirit level, and the little bubble is so sensitive to every movement of the vehicle and its movements so convulsive that it can hardly be seen as the carriage moves along. In order to meet the shortcomings of the others an improvement has been designed by J. H. Bullard, of Springfield, Mass. It consists of a curved glass tube fixed rigidly in a frame, which is to be fastened to some convenient surface of the vehicle. The lowest part of the tube is in the center, and before the tube is sealed a metal ball, having a diameter nearly that of the inside of the tube, is placed therein and the tube is then filled with some non-freezing liquid such as alcohol. The ball will, of course, seek the lowest point, and in doing so will register the grade of the hill being negotiated. While the action of the ball in finding the lowest point is not at all tardy, the resisting action of the liquid which it must displace as it moves about prevents it from being wildly agitated back and forth.



THERMOSTATIC FIRE-ALARM.

THERMOSTATIC FIRE-ALARM.—In a recent number of the SCIENTIFIC AMERICAN we described a thermostatic fire-alarm, in which the gong was rung by electricity. The inventor, H. C. Vierkaut, of Tarrytown, N. Y., has invented another thermostatic fire-alarm which is entirely mechanical in its operation. The alarm consists of a base, on which is mounted a spring-actuated train of gearing, the winding shaft of which is threaded to receive the gong. The bell clapper is vibrated by an escape wheel suitably connected with the gearing. When the temperature in the room rises to the danger point, the liquid in the thermostat expands and lifts a plunger which, through the medium of a bell-crank lever, forces in a pin at the back of the alarm base. This releases the clapper and permits the alarm to sound. The end of the plunger stem is connected with the bell-crank lever through a set-screw. By adjusting this screw the alarm can be made to sound at any desired temperature.

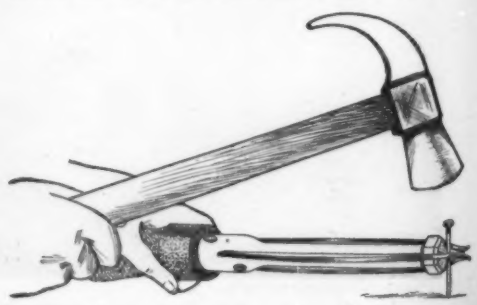
STAPLE EXTRACTOR AND HAMMER.—A United States patent has been recently issued for a combined staple extractor and hammer, which comprises a handle having a side portion cut away at one end and edge and having a rounded extremity. A member is pivoted to the handle concentric to the round end and having its long arm combined and arranged to fit snugly in the cutaway portion of the handle. A head at the outer or



STAPLE EXTRACTOR AND HAMMER.

projecting end of the opening may overlap the rounded end of the handle and project beyond its inner or lower edge. The projecting portion forms a hammer, and is notched to provide a claw to overlap the inner edge of the hammer and limit the opening of the pivoted member.

NAIL-HOLDING IMPLEMENT.—A man who has evidently experienced the difficulties of tacking down a carpet or hammering small brads and nails in inconvenient places has invented a simple hand implement adapted to hold the nail until it has been properly started. The construction of this instrument, which will be readily comprehended by a glance at the illustration, is of the simplest order, comprising a number of spring fingers secured at their inner ends to a body portion and held in alignment near their outer ends in

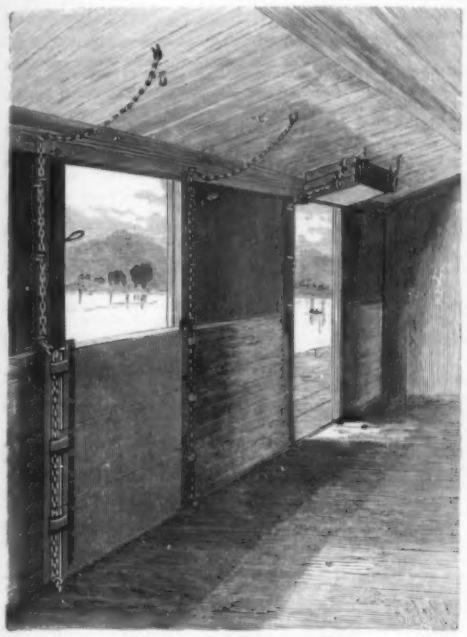


A HANDY NAIL-HOLDING IMPLEMENT.

the channels of a headpiece. The spring-fingers are adapted to hold the nail firmly against the end of this channeled head. The extremities of the spring-fingers are so formed as to readily receive the nail and permit of the withdrawal of the instrument after the nail has been partly driven. A patent for this device has been recently granted to Mr. Frank Boelk, of Walton, Minn.

IMPROVED GRAIN DOOR.

It is found necessary in railroad transportation of grain that the freight cars be provided with an inner or auxiliary door to form an extra tight closure and



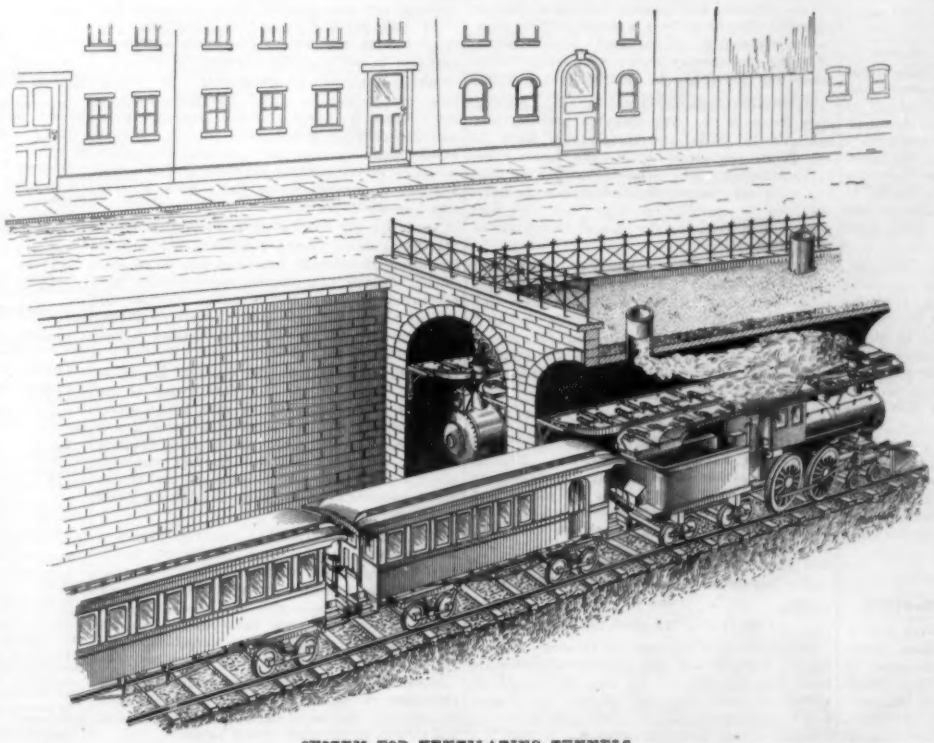
IMPROVED GRAIN DOOR.

prevent leakage of the grain. A door of this sort is provided by the recent invention of Mr. Alva T. Stark, of Geneva, N. Y. This door is composed of several sections or panels, which may be secured collectively or separately in a great variety of positions, or if desired, they may be folded up under the roof of the car, thus offering no obstruction to the door opening. Our illustration shows one of these doors in the lowest closed position and the other folded up and out of the way. The panels, which are preferably made of wood, are provided with vertical grooves at each end in which lock-plates are fitted. These lock-plates project above their respective panels, so that the upper ends of one pair of lock-plates will engage the lower ends of the grooves of the panel just above. Thus a tight connection is afforded and the grain is effectively retained. At each side of the car door is a chain, which is fastened at one end to an eye-bolt in the floor and at the other to the ceiling. The chains are provided at regular intervals with eyes which are adapted to engage hooks at each side of the door. The lock-plates on the panels are provided with guides, which loosely receive the chains and are thus held against the door posts. In order to hold the panels in the closed position indicated, it is merely necessary to draw the chains tightly and hook them onto the first hook above the highest panel, thus firmly locking the door in place. When loading or unloading the car, if it be desired to decrease the height of the door, this may be readily done. The uppermost panel is raised to the required height and locked in this position by the chains, which are hooked on the proper hooks above and below the lock-plates. When desired the next panel can be similarly raised and held, or all three of the panels may be lifted from the floor so as to facilitate the discharging of the cargo into chutes or hoppers. Pivotally fastened to the framing of the car at the top of the doorway are two arms which terminate in laterally bent eyes. These arms serve to hold the sections of the grain door in their folded position against the roof of the car, as shown at the rear in our illustration. It will be observed that when thus folded the panels all lie above the door opening and the door offers no incumbrance to the loading and unloading of the car.

SYSTEM FOR VENTILATING TUNNELS.

The main objection to crowded steam railway tunnels—an objection which was strongly emphasized by a recent disaster in New York city—is the lack of proper ventilation. Steam and smoke obscure the danger signals, thus endangering the lives on the train, and the air is vitiated by the cinders and gases so that all windows and doors must be closed—obviously a great annoyance to passengers in summer weather. Mr. John Kress, a citizen of New Rochelle, N. Y., who has daily experienced these annoying conditions, has suggested a novel method of avoiding this smoke nuisance. Since all the objectionable gases come from the smokestack, he proposes to provide a separate tunnel for the smokestack to discharge into, thus leaving the air in the main tunnel pure and uncontaminated. To this end Mr. Kress has invented the arrangement shown in our illustration. The tunnel is divided longitudinally into an upper and lower portion by a horizontal partition. This partition, which is placed at a sufficient height to clear the top of the cars, is made of two sections, which are supported by brackets on the side walls of the tunnel. Each section comprises two stationary plates, between which a series of spring-cushioned slide plates are adapted to slide. these slide-plates are provided with contact flange sections, which are interlocked with each other, so as to permit a slight play whereby an individual flange may be sprung out of its normal position without interfering with the positions of the adjacent flanges. The contact flanges of each section meet along the center line of the partition except at the ends of the tunnel, where, together with the slide-plates, they are rounded off to facilitate the entrance of the smokestack of the locomotive. The smokestack of the locomotive is provided with an extension piece fastened thereto and securely braced, which is adapted to pass in between the contact flanges. Friction bands on this extension piece serve to take up all wear from the friction of the flanges. As the smokestack passes along the flanges, the sections yield successively before the advance of the stack, but close up immediately after the transit of the same. Thus only a small elongated opening is left between the two divisions of the panel and all the smoke is confined to the upper division, whence it is drawn off by suitable ventilators, as shown, while the cinders which collect on the guide plates can be swept off from time to time into chutes at the sides of the tunnel. The air in the lower portion of the tunnel, therefore, remains pure, and there is no necessity of closing doors and windows of the cars in hot, stifling weather.

N. W. Gales, of Waterloo, Iowa, has perfected an improved disk for use in cream separators which greatly increases the efficiency of the machine. The disk instead of being plain is corrugated, and this is the essential part of the improvement. He has recently sold the right to manufacture this disk to the Clinton Separator and Engine Company for the sum of $83,000.

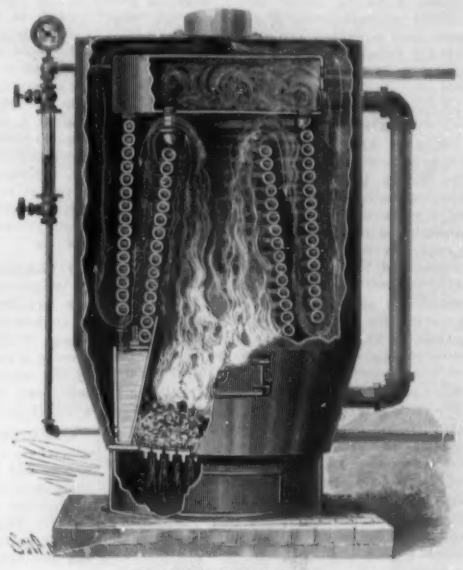


SYSTEM FOR VENTILATING TUNNELS.

HEATER AND BOILER.

An improved form of hot-water heater, which may be readily converted into a steam boiler, has recently been invented by Mr. Nathaniel B. Wales, of Braintree, Mass. The heater combines a great heating surface, a complete utilization of the products of combustion, and a simplicity of construction which obviates all danger of leakage.

The peculiar construction is clearly illustrated in the engraving, which shows the main casing partly broken away to expose the interior details. It will be noticed that the firebox is surrounded by a water chamber from which two frusto-conical coils of tubing extend upward. These tubes connect the water chamber with an upper chamber at the top of the heater. The



HEATER AND BOILER.

several turns of tubing in each coil are laid in close contact with each other, so as to form walls for guiding the passage of the hot gases from the firebox. As indicated by the arrows, the gases are forced to pass through the top of the inner coil, over the same, and down between the two coils, whence they pass out under the outer coil into the main casing of the boiler and up through the chimney. Thus it will be seen that the heat of the gases is utilized to the greatest possible extent. The inclined walls of the firebox and the coils afford a much more effective heating surface than if these walls were perpendicular. A feed, blow-off and water-return pipe enters the water chamber near the bottom, while a water-circulating pipe provides an outlet for the upper chamber.

Such is the arrangement when the invention is used as a heater, but the same construction may be used as an ordinary steam boiler by simply adding the usual steam and water gages, the pressure gage and a circulation pipe connecting the water chamber with the upper chamber. The upper chamber now serves as a steam drum, and the water level would be between the upper turn of the inner coil and this drum. The water-circulating pipe now serves as a supply pipe for the steam. All connections between the coil tubes and the iron castings are made with brass unions, so that the parts may be readily taken apart when desired, and there are no joints to spring and cause leaks.

At Westfield, Chautauqua county, N. Y., the remains of a great mastodon were unearthed. Various bones among which are the following, were found: Shoulder blade, with socket for articulation of foreleg; hip bone; section of spinal column containing four vertebræ; sections of both extremities of spinal column; knee cap, nine ribs and some other bones. The ribs are 4 feet 3 inches long and 4 inches wide. Two mastodon skeletons have been previously found in this county, one at Sheridan and one at Jamestown, but both in an advanced stage of decay.

RECENTLY PATENTED INVENTIONS.

Agricultural Improvements.

MANURE-DISTRIBUTER. — J. Howell, Schaller, Iowa. In the construction of this improved fertilizing distributer, it has been Mr. Howell's aim to provide means for breaking up clods and distributing the latter in a fine spread-out condition, to provide for positively moving the slatted bottom in either direction by the power of the moving vehicle, and to provide means for throwing the working parts out of gear in transporting the apparatus from one place to another.

FEED-TROUGH.—J. W. Barnes, Beaverton, Oregon. The feed-trough is designed more especially for feeding hogs. It is arranged to promote cleanliness and secure better sanitation by protecting the food from being soiled by the dirt of the hogs' feet. It is also so arranged as to enable small hogs to feed equally without being displaced by the large ones, and to protect the clothing of the person feeding from being soiled by the splashing and crowding of the animals.

Engineering Improvements.

SPARK ARRESTING AND DISCHARGING DEVISE.—E. J. Smith, High Springs, Fla. Mr. Smith has invented an improvement in spark-arresters and dischargers for use on coal or wood-burning locomotive engines. A spark-arresting wire screen or cage is located in the smoke box over the lower end of the stack-saddle and is provided at its upper end with a cylindrical cap having numerous slots for permitting an unobstructed draft. Means are provided for lifting the screen whenever the engine is working and the blower is applied, thus sliding the slotted cap into engagement with a flange which closes the slots and prevents sparks from passing therethrough.

PADDLE-WHEEL.—J. J. Graham, Imperial, Penn. This paddle-wheel is adapted for use on steamboats, and it comprises certain novel constructions and combinations of parts whereby it may be set automatically to proper angle to operate in the water and to rise out of the water without lifting the same whether the wheel be revolved in one direction or the other.

MOTOR.—R. L. Barnhart, Charlerol, Pa. The invention relates to an internal combustion or explosive motor, the main feature of which lies in the provision of a receiver in which the charge is exploded, and which serves to carry a continual pressure of gas, this pressure being communicated from the receiver to the motor, which is thereby driven.

Hardware and Tools.

PROFILE-TOOL FOR MAKING PIPE-MOLDS.—Franz Burgers, Bulmke, Germany. The tool is intended for use in that class of molding machines in which a pressing block having a spiral compression face gives, by rotation, the molding sand which is in a flask the necessary impression, and in connection with the cylindrical molding block forms the outer mold for the pipe. A core being set in the mold, the latter is ready for casting by the usual well-known methods.

WIRE-FENCE TOOL.—C. Whipple, Ashley, Ohio. This tool is specially designed for stapling wooden lath to the line-wires of wire fences. The construction is such as to hold a stay against the line-wire and the staple against the stay imbedded more or less therein, and the ends of the staple across the line wire, enabling the operator to use both his hands for the purpose of coiling the ends of the staple around the line wire at the side edges of the stay.

SEPARABLE SQUARE.—C. L. F. and M. C. Hooker, Boca, Cal. This instrument has been invented for the use of carpenters and other mechanics and is arranged to permit of conveniently separating the members for folding the square so as to take up comparatively little space in a tool chest. When the members are fitted together and locked in place their surfaces are flush with each other, so that they may be conveniently used in the usual manner the same as any ordinary rigid square.

SCREW-DRIVER.—G. E. Gay, Augusta, Me. This screw-driver is of the ratchet type and is provided with a single pawl so arranged that it may be adjusted to cause the movement of the blade with the handle in either direction, the blade remaining stationary while the handle is turned in the reverse direction, or it may be adjusted to form a lock between the blade and handle, so that they will move together.

FENCE-LOCK.—W. B. MacLean, Galetta, Canada. The fence-lock is designed for securely fastening the longitudinal wires to the pickets of the fence. The lock is simple and durable in construction, very effective in operation, and may be readily applied to securely fasten or bind the parts together.

Machines and Mechanical Devices.

ACCOUNTING ATTACHMENT FOR TYPE-WRITING MACHINES.—O. L. Ingram, Walla Walla, Wash. Mr. Ingram has provided an improved attachment for typewriters which permits of convenient addition and computation. The device may be readily secured to the machine and operated by the numeral finger-levers without in any way interfering with the ordinary work of the typewriter. By its use any number of columns of figures printed will be accurately indicated, thus making it particularly useful in tabulating, bill, and invoice work.

FRICTIONAL GEARING.—W. D. Dailey, Polendale, West Va. In sawmills and other machine plants it is sometimes desirable to employ one motor having power sufficient to work various separate and distinct machines, and in such a plant it is sometimes necessary to stop one machine without interfering with the operations of another. For the purpose of meeting these conditions Mr. Dailey has invented an improved frictional gearing which is designed to obviate objections heretofore existing in connection with similar gearing.

COTTON ELEVATOR AND SEPARATOR.—C. R. Benefield, Dallas, Texas. This invention is an improvement in that class of pneumatic elevators in which cotton or similar substances are raised and then released and deposited at a selecting point by variation of air pressure. In operation the cotton is drawn into a cotton-pipe past toothed bars and against a screen by which the dust and sand are extracted and the cotton given a downward impulse, which, being resisted by gravity, dislodges the cotton from the screen and causes it to drop into a chute. When a sufficient quantity has here accumulated, it overcomes the suction and drops downward through a valve.

LOG-RELEASING DEVICE FOR SCOWS.—E. W. Spencer, Portland, Oregon. This invention has for its object to release chock-blocks or timbers slidably mounted on the outer ends of the inclined trusses, secured to the deck of a scow, whereby the logs held on these trusses by the chock-block or timbers are permitted to roll down the trusses and off the scow onto a wharf or other receiving agent.

GEARING.—W. L. Voss, Harvey, Ill. This gearing is designed to be driven at different speeds and is particularly adapted for use in connection with hoisting apparatus. The mechanism comprises a driving-shaft geared directly to the element to be driven, and a second driving shaft independent of the first but connected thereto by gearing embodying a clutch automatically operative upon the movement of the second shaft, whereby the two shafts are connected and disconnected.

CHECKING-MACHINE. — F. R. Wainwright, Jersey City, N. J. Mr. Wainwright has invented an improved checking-machine designed more especially for use in restaurants and like places. The machine is arranged to print the number of each check, the amount of each check, the amount of each item on the check, the number of guests enumerated in the check, the number of the waiter, and the amount of money collected by the waiter, also a correct record of all transactions upon a continuous duplicate slip.

WASHING-MACHINE.—G. Thomas, Gothenburg, Neb. Mr. Thomas has invented an improved rubbing surface for washing-machines of the class which employs a swinging receptacle. The rubbing surface co-operates with the rubber for the easy and thorough cleansing of fabrics of different kinds and may be easily removed. The rubber operating means can be actuated with small exertion by the attendant to allow the ready introduction or removal of the clothes.

REVERSING MECHANISM.—R. R. Reck, Marienville, Pa. This reversing mechanism is composed of comparatively few parts, not liable to get out of order, and arranged to permit of conveniently and quickly driving a shaft in different directions from a single pulley rotating continuously, at the same time allowing of using the driving pulley as a loose pulley when the parts are in intermediate position.

BUTTONHOLE-CUTTER.—L. F. Monck, New York, N. Y. The machine will cut buttonholes in goods and incidentally mark on the goods the places where the buttons are to be attached. The construction is such that the work may be rapidly and accurately done, resulting in economy of labor and time and consequently reducing the cost of production of the garments.

TIME-STAMP.—N. Collins, Monument Square Chambers, London, Eng. The apparatus will print a record of the hour and minute at which the time stamp is operated. The device is primarily intended for use in connection with a cash register for denoting the time in which each transaction is recorded.

Medical Apparatus.

VAGINAL INJECTOR.—A. Anderson and M. B. S. B. Packness, Denver, Col. This injector is capable of expanding the vagina to its fullest extent, laying open the mouth and entire lower parts and sides of the uterus, thus permitting every part of the female organs to be thoroughly douched. By reason of its perfect shape the apparatus can be safely and easily introduced and as easily withdrawn.

Railway Improvements.

PASSENGER-CAR.—J. M. Osgood, Boston, Mass. Certain new and useful improvements have been invented by Mr. Osgood for use on passenger cars, whereby perfect ventilation and heating are obtained. The method of ventilation is not only operative for winter service, but is just as applicable for cooling purposes in the summer. Two compartments in a section of a car when made up for night use are separate and distinct from each other, each having its own ventilator. The occupant of a berth can open a corresponding register and receive a cooling breeze from below, if desired, and the arrangement is such that no cold draft will fall upon him.

TRACK-INDICATOR.—S. A. Staege, Hutchins, near Mattoon, Wis. The device is adapted to indicate the variation in the distance of railway rails from each other, so as to enable persons to detect any spreading of the rails. The appliance is intended especially for use on hand-cars, so that the trackmen in going over the road need only to run the car over the rails to detect any spreading thereof.

DUST-GUARD.—J. S. Patten, Baltimore, Md. The dust-guard is adapted for use in car-axles boxes and comprises a novel, simple construction which can be cheaply made, will fit any ordinary car-axle box and will be durable and efficient in use to prevent the entrance of dust in the bearings.

Miscellaneous Inventions.

FAN ATTACHMENT FOR ROCKING-CHAIRS.—E. O. M. Haberacker, Altoona, Pa. This device can be readily attached to a chair so that as the chair is rocked to and fro the fan will be operated. The improvement lies in the simplicity and ease with which the attachment may be affixed to the chair. The device may also be folded back out of the way and locked against operation whenever desired.

DARNING-LAST.—Mary G. Tilney, Orange, N. J. The darning-last is made cup-shaped and has a substantially ovate contour. It is provided at the upper edge with a shoulder so that the stocking may be clamped thereon by means of a wire frame designed to engage this reduced portion. The material is thus properly held for darning.

PLASTER COMPOSITION.—M. T. J. Ochs, Allentown, Pa. This plaster comprises powdered hydraulic cement, 2 parts; powdered silicate of aluminium, 1 part, and powdered carbonate of lime, 1 part, the silicate of aluminium and carbonate of lime being in a raw state saturated with water, and all the powdered substances being admixed together.

TABLE.—G. H. Bullock, Wakefield, R. I. This table is particularly designed as a dining table and is provided with a stationary outer section of sufficient width to accommodate the covers for the guests and a center revolving section upon which food is to be placed, whereby each guest by revolving the center section can gain convenient access to any dish thereon.

COVERING FOR DEMIJOHNS.—J. G. Bahr, Brooklyn, N. Y. This improved covering for demijohns is easily applied and is arranged to protect the glass vessel against pressure, to provide a firm handle, and to retain the contents of the glass vessel in case the sides thereof become cracked.

LEAD PENCIL.—L. C. Benitz, Philadelphia, Pa. The invention belongs to that class of pencils whose leads are adapted to slide freely and are secured in any position by means of an elastic device arranged to work in frictional contact therewith. Mr. Benitz has devised an improved means for holding the lead very firmly against upward movement and preventing it from rotation on its axis, but it may be readily drawn out when required.

REIN-GUARD.—J. T. West, Bowling Green, Ky. Mr. West has invented an article which may be attached or detached from the harness, and will not detract from the appearance of the harness, but will serve to effectually guide the reins and prevent them from becoming entangled with the tail of the horse and from catching in parts of the harness.

HYDROCARBON-BURNER.—M. W. Morgan, Mount Vernon, Ind. The improvements are adapted for burners of gas, generated from gasolene or other hydrocarbon oil. The burner is of simple construction, arranged for either house or street lighting purposes and designed to give a strong, white light with a very small consumption of oil.

METHOD OF PRODUCING FIGURED PILE FABRIC.—Otto Timme, New York, N. Y. The invention provides an improved method of producing figured pile fabrics in a simple and economical manner, and forming, without the use of a jacquard, the desired pattern in relief, and for closely imitating in color a jacquard-produced pile fabric.

BOTTLE-WASHING BRUSH.—C. K. Volckening, Brooklyn, N. Y. This brush is designed for use in connection with bottle washing machines and it embodies a novel means for preventing the rubber brush from slipping off the expanding fingers. Another improvement lies in the construction of the brush, which permits of thoroughly cleaning all parts of the bottle bottom.

MOLD FOR ARTIFICIAL TEETH.—Thomas Steele, Red Bank, N. J. Improved means have been provided by Mr. Steele for forming artificial teeth which permits individual adjustment of the core pins and permit of accurately setting the core pins relative to the tooth forms to ensure proper formation of the teeth.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 2989.—For manufacturers or dealers in collapsible tubes suitable for paint, ointment, etc.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 2990.—For ozonin for bleaching fabrics.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 2991.—For makers of spinning looms for cotton cloths operated by foot power.

WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

Inquiry No. 2992.—For makers of machines for spinning tapes or bobbins ⅝-inch or under width.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 2993.—For makers of machines for making pearl buttons.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 15, Montpelier, Vt.

Inquiry No. 2994.—For small paper or celluloid capsules, for keeping powder air tight, or nearly so.

Metal Stamping Co., Niagara Falls, N. Y., cuts and forms sheet, bar, rod, or wire any shape.

Inquiry No. 2995.—For machinery for making cotton batting and felted cotton for making mattresses.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Bldg., Rochester, N. Y.

Inquiry No. 2996.—For a machine for separating fiber from the pulp.

Die work, experimental work and novelties manufactured. American Hardware Mfg. Co., Ottawa, Ill.

Inquiry No. 2997.—For manufacturers of talcum powder boxes.

Partner wanted to exploit invention. Butter show-case and keeper, all glass. M. J. Goldsmith, Warrentown, Pa.

Inquiry No. 2998.—For makers of spring motor ceiling fans.

We design and build special and automatic machinery for all purposes. The Amstutz-Osborn Company, Cleveland, Ohio.

Inquiry No. 2999.—For manufacturers of scrubbing, blacking and clothes brushes.

Special and Automatic Machines built to drawings on contract. The Garvin Machine Co., 149 Varick, cor. Spring Streets., N. Y.

Inquiry No. 3000.—For castings for small motors and dynamos.

IDEAS DEVELOPED.—Designing, draughting machine work for inventors and others. Charles E. Hadley, 324 Hudson Street, New York.

Inquiry No. 3001.—For dealers in second-hand gasoline engines and launches.

WANTED.—A partner in competing for the bonus offered by New Zealand for a new gold-saving device. P. McEntee, Montgomery, Minn.

Inquiry No. 3002.—For a hand illuminating gas igniter (not to be attached to burner).

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 3003.—For parties to manufacture hooks and eyes.

Patents developed and manufactured, dies, special tools, metal stamping and screw machine work. Metal Novelty Works Co., 45-47 S. Canal St., Chicago.

Inquiry No. 3004.—For makers of machines for grinding leather.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 3005.—For a clock with a registering dial for use on vehicles, to register time of the journey and stops.

WOODWORKING MACHINERY.—The advertiser, who has invented and designed for others a line that has brought large returns, is looking for capital against experience and know how. None but mutually satisfactory arrangements desired or expected. Address Experience, Box 773, New York.

Inquiry No. 3006.—For parties to do twisted wire work in large quantities.

WANTED.—Several experienced mechanical and structural draughtsmen. Call Employees Registration and Bonding Company, 61 and 63 William Street, New York.

Inquiry No. 3007.—For power machines for perforating sheet metal.

Inquiry No. 3008.—For coffee mills run by hand or foot power.

Inquiry No. 3009.—For makers of block tin flasks.

Inquiry No. 3010.—For makers of furniture hardware.

Inquiry No. 3011.—For the address of the United States Machine Co.

Inquiry No. 3012 —For manufacturers of interior woodwork.

Inquiry No. 3013.—For makers of amusement devices, merry-go-rounds, etc.

Inquiry No. 3014.—For makers of handle machinery.

Inquiry No. 3015.—For a machine for sanding and polishing sad iron handles.

Inquiry No. 3016.—For makers of gas machines.

Inquiry No. 3017.—For makers of moving picture machines.

Inquiry No. 3018.—For makers of ice machines of small capacity.

Inquiry No. 3019.—For a hand power ice machine for making 20 to 30 pounds of ice in one operation.

Inquiry No. 3020.—For machinery and information for the manufacture of brooms.

Inquiry No. 3021.—For pneumatic motors and appliances for furnishing the air.

Inquiry No. 3022.—For rough castings of the Fleming & Morgan motor.

Inquiry No. 3023.—For makers of lightning rods.

Inquiry No. 3024.—For a five hundred-light dynamo.

Inquiry No. 3025.—For small wheels for register work, to show numbers registered.

Inquiry No. 3026.—For a rectifier for changing an alternating current to a direct current.

Inquiry No. 3027.—For economical pumps or apparatus for lifting quantities of water for irrigation.

Inquiry No. 3028.—For machinery for canning fruit on a small scale.

Inquiry No. 3029.—For machinery for a tannic acid plant.

Inquiry No. 3030.—For oil burners for boilers.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

August 5, 1902,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

DESIGNS.

TRADE MARKS.

LABELS.

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"Bell's barbwire liniment," for liniment, G. W. Bell & Son 9,343
"Blue Bell," for flour, Detroit Milling Co. 9,360
"Chase & Sanborn Real Brand Coffee," for coffee, Chase & Sanborn 9,356, 9,357
"Colorado Rocky Mountain Cough and Catarrh Root," for a medicine, Blanchard & McIntyre 9,342
"Cook's Budweiser," for bottled beer, F. W. Cook Brewing Co. 9,350
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"We Sell Masurite Safe Explosive," for an explosive, Masurite Explosive Co. 539
"Zapha," for shoe-polish, R. J. Quinn & Co. 538

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

NEW BOOKS ETC.

JOHNS HOPKINS UNIVERSITY STUDIES IN HISTORICAL AND POLITICAL SCIENCE. J. M. Vincent, J. H. Hollander, W. W. Willoughby, Editors. State Banking in the United States Since the Passage of the National Bank Act. By Geo. E. Barnett, Ph.D. Baltimore: The Johns Hopkins Press. 1902. Pp. 117.

NOTES ON THE CONSTRUCTION OF THE VIOLIN. By W. B. Coventry, M. I. C. E. London: Dulau & Co. 1902. Pp. xi-80. 32mo. Price 75 cents.

Mr. Coventry has written a book which it is a pleasure to read. He tells us in a very entertaining way what elements must enter into the construction of violins, and something about the work of the old Italian and French violin-makers. The publishers have brought the book out in a very neat dress.

UNCLE SAM TRUSTEE. By John Kendrick Bangs. New York: Riggs Publishing Company. 1902. Pp. ix-342.

To the reader who knows Mr. Bangs only as a writer of very humorous tales, the present book will come almost with a shock of surprise. Many will hardly recognize the hand of the man who wrote the "House Boat on the Styx" and "Mr. Napoleon Bonaparte of Corsica." "Uncle Sam Trustee" is a brief sketch of the history of Cuba, comprising a consideration of relations which for a century or more have existed between the people of that island and our own country, a statement of the results of the Spanish war, in so far as it involved Cuba alone, and a general statement of the conditions prevailing at the beginning of the American campaign. Mr. Bangs' connection with Harper's Weekly naturally placed at his disposal a vast amount of material, which he has used in the writing of his book. The text is accompanied by many illustrations.

THÉORIE DE LA LUNE. Par H. Andoyer. Paris: C. Naud. 1902. 16mo. Pp. 86. Price 50 cents.

Prof. Andoyer has presented in this monograph of his all that we know of the mechanics of the moon. His book is simply packed with information. In the comparatively small number of 86 pages he has managed to tell us everything that the modern astronomer knows of the motions of the heavenly body which is nearest us.

NOTES ON LEAD ORES. Their Distribution and Properties. By James Fairie, F. G. S. London: Scott, Greenwood & Co. New York: D. Van Nostrand Company. 1901. 16mo. Pp. 64. Price $1.

The late James Fairie some years ago prepared a series of technical articles on lead ores, which proved of unusual value and interest. These articles have now been collected and published in book form. Coming as they do from a painstaking and practical geologist, they should be welcomed all the more so since the literature on the subject of lead ores is only too limited.

GÉOMÉTROGRAPHIE OU ART DES CONSTRUCTIONS GÉOMÉTRIQUES. C. Naud. 1902. 16mo. Pp. 87. Price 50 cents.

Geometrography is but a mere detail in the science of geometry; but that detail is of such importance and interest that a discussion of its various phases should prove of interest. Furthermore, the comparative novelty of the topic renders a treatise in which it is discussed particularly valuable at this time.

The first part of this present book comprises a very short theory, which is nothing more nor less than the indication of notations with adopted conventionalities. The second part is a development of the preceding studies, and treats of various relative constructions well known and of exceeding importance in geometry.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled

(8661) I. L. asks how to metalize insects so as to render them capable of coating by the galvanoplastic process. I have tried phosphorus and bisulphide of carbon, but find it very dangerous, as it is liable to burst into flames instantly. A. Dissolve 1 ounce of phosphorus in 1 pound of bisulphuret of carbon by frequent agitation. Add to this solution 1-3 pound of beeswax and mutton tallow 1-3 pound. Dissolve by gentle heat and guard against fire, as the mixture is very inflammable. To this add 1 pint of spirits of turpentine and 2 ounces of pure unvulcanized rubber dissolved with 1 pound of asphaltum in bisulphate of carbon. When the solution is complete, it can be applied to insects, flowers, etc., which are then dipped in a weak solution of nitrate of silver or chloride of gold. In a few minutes the articles are covered with a thin film of metal. They can be plated in the usual way.

(8662) E. H. writes: I have need of a resistance of 25 ohms in the form of a strip of German silver ⅝ inch wide, 24 inches long. How thick must it be, or what gage? If I should use it ½ inch wide, 24 inches long, what gage must I use? A. To get 25 ohms resistance with a strip of German silver ½ inch wide and 24 inches long will require that it be five millionths of an inch thick. If it be ⅝ of an inch wide, it may be a thought thicker. German silver has 13 times the resistance of copper. Hence a copper wire for the same size might be 26 x 2 feet or 28 feet long. And if 26 feet have 25 ohms, one ohm will be 1.04 feet long. Our wire table gives No. 39 wire as having 1.20 feet per ohm, which is near enough. Hence a German silver wire of the same size would have 25 ohms for a length of 2 feet. The problem then is to find the thickness of a plate whose sectional area is as great as a No. 39 wire, and whose width is a half inch. The diameter of the wire is 0.00353 inch. Its area is 0.00001 square inch. One-half of this is 0.000005 inch.

(8663) R. R. S. asks: Why cannot the high-voltage alternating currents induced in the secondary of an induction coil be changed to direct currents and used the same as other currents of high voltage? A. The induction of an alternating e. m. f. is a necessity of the action of an interrupted direct current. When the primary circuit is made, the induced current in the secondary is in the opposite direction from the current which induced it, since that is the proper effect of an increase of magnetic flux upon the turns of the winding; when the primary circuit is broken, the opposite effect is produced, and the induced current is in the same direction as that of the current which induced it. The induction of an alternating current by an interrupted direct current is therefore a necessity. Now, as to the transformation of such an alternating current into a direct current. When a condenser is employed with an induction coil, the induced e. m. f. upon making the primary circuit is much weaker than that which is set up by breaking the circuit. Because of this fact, when the spark terminals of an induction coil are separated so far that the e. m. f. set up upon making the primary circuit cannot throw a spark across the gap between them, the spark passes only upon the breaking of the primary circuit, and the induced current is a direct current, acting by impulses, there being as many impulses per second as there are interruptions of the primary current at the vibrator or interrupter. This is the method in which induction coils are ordinarily used for experiments. If one would see the spark at making the primary circuit, he can produce it by bringing the spark terminals nearer together, till a spark is produced upon making the primary circuit. This spark is from positive to negative in the opposite direction from the spark upon breaking the primary circuit. No way has been discovered for using such an arrangement as a source of power or for lighting lamps, so that it can compete with the alternating-current dynamo, generating an electromotive force high enough for all practical purposes. Any transformer is operated at some loss, and the induction coil, throwing a spark through a wide gap of air, is not an economical transformer.